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# Journal of Applied Economic Sciences

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## Regime Heteroskedasticity in Bitcoin: A Comparison of Markov Switching Models

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### Abstract:

We deploy a discrete state hidden Markov regime switching (MRS) model to investigate the volatility dynamics of Bitcoin. Firstly, to isolate the heterogeneous volatility regimes, secondly to map the regime switches and thereby identify the pertinent volatility dynamics, and thirdly to determine the optimal number of states for capturing the regime heteroskedasticity of Bitcoin. As such, we fit a sample of daily log returns for the cryptocurrency with six  $M$ -states MRS models, with  $M \in \{2, \dots, 7\}$ . Where was necessary, we parsed the estimations through a transition restriction matrix. Goodness-of-fit will be judged using three information criteria, namely Bayesian (BIC), Hannan-Quinn (HQ) and Akaike (AIC). We determined unanimously that the restricted 5-state model generated the optimal estimation for the sample. In addition, through examination of the resultant restricted transition probabilities, we found consistent evidence of several dynamic nonlinear characteristics in the data, namely volatility clustering, non-sequential regime switches, asymmetric regime switches and the persistence of shocks.

**Keywords:** Bitcoin; Markov; regime; nonlinearity; volatility; jumps.

**JEL Classification:** C1; C4; C5; C13; C22; G1.

### Introduction

The stochastic variance often found within the time series of financial returns, is the manifestation of dynamic nonlinear characteristics within the series. The presence of such features necessitates the use of nonlinear models to more accurately reflect the volatility dynamics of the data. The historical price data of Bitcoin is littered with a plethora of structural breaks and distinct volatility regimes (Molnár and Thies 2018). We deploy a discrete state Markov regime switching (MRS) model. Firstly, to isolate the heterogeneous volatility regimes, secondly to map the regime switches and thereby identify the pertinent characteristics of said regimes, and thirdly to identify the optimal number of states for an MRS model to capture the regime heteroskedasticity of Bitcoin.

By construction, the application of a Markov regime switching model on time series containing structural breaks is considered apropos. Therefore, we fit a sample of Bitcoin's daily log returns with six  $M$ -state MRS estimations, with  $M \in \{2, \dots, 7\}$ . Where necessary, we use transition restriction matrices to parse the data. In addition, we use maximum likelihood (ML) methodology to estimate the unknown parameters of the transition and observation probability matrices. Goodness-of-fit will be judged using three complexity-penalizing information criteria, namely Bayesian (BIC), Hannan-Quinn (HQ) and Akaike (AIC).

Following on Section 2 reviews the current literature, Section 3 introduces the data, Section 4 presents the methodology, Section 5 states the empirical results, Section 6 discusses these results and Section 7 concludes.

### 1. Literature review

Cryptocurrencies are digital "assets" motivated to act as a medium of exchange, supposedly outside the influence of any government or central bank. They are based upon high-level cryptography that is applied to not only secure and verify transactions, but to also modulate the creation of additional coins from a finite issue. As more coins are "mined", the remaining coins become more costly to decrypt, thereby providing an artificial scarcity and driving a perceived value based upon rarity and cost. The genesis of the cryptocurrency gold rush can be traced back to the seminal paper published under the pseudonym Satoshi Nakamoto in 2008. Various individuals have either been accused of being the elusive Nakamoto or have stood up to pronounce "I'm Nakamoto". However, mystery still surrounds the true identity of the individual, or group, who first proposed a peer-to-peer (P2P) transactional system based upon the Blockchain distributive-ledger technology (Nakamoto 2008). The first cryptocurrency built on

Blockchain was Bitcoin in 2009. Since then, hundreds of other cryptocurrencies have been launched. The total capitalisation of the cryptocurrency market, as of 30th June 2019, is US\$323 billion ([www.coinmarketcap.com](http://www.coinmarketcap.com)).

These pseudo-currencies have not been far from the headlines over the past year due to the exceptional bubble, and subsequent crash, in the price of Bitcoin towards the end of 2017. Since then, the value of Bitcoin, and many other cryptocurrencies, have drifted slowly lower through most of 2018. However, as Mark Twain expressed “History does not repeat itself, but it often rhymes.” We have seen this all before, in the bubble and crash of Bitcoin in 2013. Retail investors will lick their wounds as a result of the most recent crash, but they will probably not learn their lessons. In addition, cryptocurrencies have also made headlines with respect to crypto exchanges being hacked, assets being stolen and in some cases the exchange itself collapsing into bankruptcy. The systematic and systemic risk surrounding these unregulated instruments cannot be ignored. The U.S. Securities and Exchange Commission (SEC) has warned of a possible inability to “pursue bad actors or recover funds”, due mostly to the decentralized and unregulated nature of the cryptocurrency marketplace.

In addition, the UK's Financial Conduct Authority (FCA) issued advice on the risks of investing in cryptocurrencies, citing leverage, charges, funding costs, price transparency and price volatility as the major risks associated with trading such instruments. Whilst the authors of this paper do not promote investment in the current unregulated crypto market, we do expect that regulated cryptocurrencies will appear in the future, supported by the benefits of blockchain for verifying the provenance of digital assets.

### 1.1. Regime changes in financial markets

The assumption of constant volatility over some specified period for the time series of financial assets, is statistically inefficient and logically inconsistent (Campbell *et al.* 1997). This is due to the fact that such time series tended to demonstrate *volatility clustering*, *i.e.* large (small) returns were typically followed by large (small) returns. This is one of three stylized facts often stated when discussing financial time series (Mandelbrot 1963a, 1963b and 1967). The other two facts are *heteroskedasticity of variance* and *non-normal leptokurtic behavior* of financial asset returns. An additional stylized characteristic exhibited by financial time series is the “leverage effect”. This term evolved over time and refers to the asymmetric phenomena of negative returns presenting higher volatility than positive returns of the same magnitude (Black 1976). Reasons proposed for the presence of volatility clustering and the heteroskedasticity of variance in financial time series include dependence on the rate of information arrival to the market (Lamoureux and Lastrapes 1990), errors in the learning processes of economic agents (Mizrach 1990) and the artificial nature of a calendar timescale in lieu of a perceived operational timescale (Stock 1998).

The manifestation of these stylized facts in financial markets, was such that markets tended to change their behavior in a sudden manner. The duration for which the new behavior persisted was generally unknown *ab intra*. Regime switching models are able to capture sudden changes in the price dynamics of financial assets, where such changes arise as a result of the aforementioned inherent stylized characteristics (Ang and Timmermann 2012). Whilst regime switching models can be used to identify past categorical delineations in time series data, where regimes were found econometrically, they can also be used for *ex-ante* forecasting and optimizing portfolio choice in real-time (Ang and Timmermann 2012). In addition, regime switching models are able to accommodate jumps in financial time series, by simply considering each jump as a special regime that is exited in the immediately following instance (Ang and Timmermann 2012). Given the evident structural breaks in the price volatility of Bitcoin (Molnár and Thies 2018), we expect to see evidence of such volatility jumps in the results of our MRS estimations.

The first application of a regime switching model, related to the business cycle moving from states of expansion to recession and back again around a long-term trend (Hamilton 1989). Since then, regime change models have been applied to a variety of financial applications such as equities selection (Pagan and Sossounov 2002). Regime change models have also been fitted to U.S. monetary policy data, in the form of a four-state regime switching model with time-varying coefficients to capture changes in policy rule (Sims and Zha 2006).

Regime switching models have also been applied to non-financial scenarios. A discrete state regime switching model was used to estimate the transition probabilities of a simple four-state model aimed to emulate the arms race between Turkey and Greece over the period 1958-1997 (Smith *et al.* 2000). The four states represented whether each country chose a high or low share of military expenditure, with payoffs assumed to match those of the Prisoner's dilemma. Translating a relatively simple two-by-two game theory exercise into an empirical model was a complicated process, requiring 19 free parameters (Smith *et al.* 2000). Although the number could be reduced by making basic assumptions with regard to the strategy of each player. Similarly, we will examine the transition probabilities within the unrestricted MRS estimations for Bitcoin and make the basic assumption that near-zero values are instead zero values. To do so, we will fit transition restriction matrices when required. This will decrease



the complexity of the estimation process and the associated computational runtimes, whilst purportedly also increasing the goodness-of-fit of the results.

A new approach to modelling regime switching incorporated an autoregressive latent factor that determined regimes dependent on whether some threshold level was breached (Chang *et al.* 2017). This is opposed to previous models that permitted the latent factor to be endogenous with the innovations of the observed sequence, rather than exogenous, which would otherwise have transformed the approach back into the conventional Markov regime switching model (Chang *et al.* 2017).

### 1.2. Markov regime switching models

Markov regime switching (MRS) models assume that an observed process is motivated by an unobserved state process. Such models are a special form of dependent mixture model. The models consisting of two parts, namely a parameter process that satisfies the Markov property and a state-dependent process, that results in the distribution of specific observations being dependent only on the current state and not on previous observations or states (Langrock *et al.* 2016). The mathematical grounding of these models was first developed 1966 and used a Markov process to simulate the hidden sequence by which an observed sequence was generated. This approach used maximum likelihood (ML) methodology to estimate the unknown parameters of the transition and observation probability matrices (Baum and Petrie 1966). The computation of the likelihood,  $L_T$ , of  $T$  sequential observations  $(x_1, x_2, x_3, \dots, x_T)$  for an  $M$ -state Markov regime switching model should require  $TM^T$  operations. However, a convenient formula for the likelihood of such models requiring only  $TM^2$  operations has been derived (Kim 1994). Regime switching models are perfectly suited to handling data that is over-dispersed and serially dependent (Langrock *et al.* 2016).

After the solution for a single observation sequence was first developed in 1970, it was quickly realized that Markov regime switching models were suitable for capturing stock market behavior and weather forecasting (Baum *et al.* 1970). However, it was a further 13 years before a solution for multiple observation sequences was published. The solution required the development of the “left-to-right” model and also assumed independence between each observation sequence (Levinson *et al.* 1983).

Almost two decades later, the restrictive assumption of independence in the multiple observation sequences' framework was dropped (Li *et al.* 2000). In doing so, two types of multiple observation sequences were identified, namely the uniform dependence observation sequences and the independence observation sequences. A year later, an extensive tutorial linking HMMs and Bayesian Networks were published (Ghahramani 2001). Thereby enabling new generalizations of MRS models, using multiple unobservable state variables, as well as combined continuous and discrete variables. Over the last decade, MRS models have been applied to the time series of more traditional financial assets, including forecasting stock prices (Hassan and Nath 2005), predicting regimes in inflation indexes (Kritzman *et al.* 2012) and selecting stocks based on predicting future regimes (Nguyen and Nguyen 2015).

### 1.3. A fool's errand

Since 2009, interest in cryptocurrencies has experienced exponential growth, buoyed by the changing demographics of society with respect to the acceptance of disruptive innovation in financial technology (FinTech). As such, efforts into modelling the conditional moments of the flagship cryptocurrency Bitcoin have been extensive. There have been numerous studies published into finding the optimal single regime generalised autoregressive conditional heteroskedasticity (GARCH) model for Bitcoin, including the linear GARCH model (Glazer *et al.* 2014) and (Gronwald 2014), the Threshold GARCH (TGARCH) variant (Bouoiyour and Selmi 2015) and (Dyhrberg 2016) and the Component GARCH (CGARCH) variant (Katsiampa 2017).

The simplifying assumption that a single regime GARCH model is suitable for capturing the price risk of a cryptocurrency is simply ill-founded. Regime heteroskedasticity has been shown to be present in the time series of many financial asset returns, including Bitcoin (Molnár and Thies 2018). The number of volatility regimes in Bitcoin has been examined using a Bayesian change point model, that detected structural changes in the cryptocurrency and then categorized partitions of the entire time series into one of seven volatility regimes (Molnár and Thies 2018). If single regime GARCH models are applied to time series that contain structural breaks, however, the resultant estimates tend to be biased and the forecasts inferior (Bauwens *et al.* 2010) and (Bauwens *et al.* 2014). Therefore, searching for the optimal single regime GARCH variant for Bitcoin may well have been a fool's errand for the authors mentioned previously.

The pressure to publish has led many authors to present poorly conceived papers into the optimal single regime GARCH variant for estimating and forecasting the conditional variance of cryptocurrencies (Katsiampa

2017). Notwithstanding the apparent confusion between daily growth rates and daily log returns, (Katsiampa 2017) identified the Component GARCH (CGARCH) variant as optimal for the estimation of the conditional variance of Bitcoin. This finding was under the ill-conceived assumption of conditionally normally distributed innovations. However, given the fundamental definition of the GARCH model, the distribution of innovations fits hand-in-glove with the conditional distribution of future returns (Sun and Zhou 2014). In addition, the resultant kurtosis associated with the assumption of Gaussian innovations, tended to significantly underestimate the observed kurtosis (Bai *et al.* 2003).

A more straightforward approach would be to assume Student's  $t$ -distributed innovations, since the distribution possesses thicker tails than the Gaussian distribution, especially when the degrees of freedom are low. However, the Student's  $t$ -distribution does not possess a moment generating function (Shaw 2018). Therefore, applying Student's  $t$ -distributed innovations within a risk-neutral framework for financial engineering purposes, could result in a call option that possessed infinite value (Shaw 2018). The lack of an MGF for the skewed generalized error distribution (SGED) in certain circumstance meant that this was also a poor solution (Shaw 2018). It has been demonstrated that the innovations of a simple single regime linear GARCH ( $p, q$ ) model, with  $p, q \in \{1, \dots, 5\}$ , when fitted to six major cryptocurrencies including Bitcoin, were indeed conditionally non-normally distributed (Shaw 2018). This was achieved by applying a Kolmogorov-type non-parametric test to eliminate the possibility of Gaussian innovations.

#### 1.4. Markov regime switching GARCH models

The ARCH model provides relatively poor forecasts and spurious high persistence issues that arise from using such models on samples that contained distinct volatility regimes (Hamilton and Susmel 1994). Being able to model regime switching along with conditional heteroskedasticity, allows for the capture of changes in the factors that affect volatility and overall reflect the changing nature of market conditions (Hamilton and Susmel 1994). Over the past two decades, MRS-GARCH models have been used to estimate the conditional variance of more traditional financial time series, including stock index returns (Mizrach 1990) and (Henry 2009), commodity returns (Alizadeh *et al.* 2008) and exchange-rate returns (Wilfling 2009).

Recently, the MRS and GARCH methodologies were combined under the framework of conditionally non-normally distributed innovations for Bitcoin (Ardia *et al.* 2018). The 2-state MRS-GARCH model was identified as the optimal model for capturing the regime and variance heteroskedasticity of Bitcoin. In addition, the combined model outperformed the single regime GARCH model within the comparative frame of forecasting value-at-risk (Ardia *et al.* 2018). A major issue with the 2-state MRS model, however, is that it does not allow for volatility jumps. Transitions in the 2-state MRS model can only occur between the adjoining states and not to additional disjoint states, as is the case with higher dimensional MRS models.

We therefore recoil from the myopic pursuit of identifying the optimal single regime GARCH variant for Bitcoin for the reasons already stated above. Instead, we fit six  $M$ -state Markov regime switching (MRS) models, with  $M \in \{2, \dots, 7\}$ , to the price data of Bitcoin. In order to identify the optimal number of states for modelling the cryptocurrency's regime heteroskedasticity and investigate the nature of the volatility transition in the data. We will use maximum likelihood (ML) for fitting the models and goodness-of-fit between the estimations will be judged using three negated information criteria, namely Bayesian (BIC), Hannan-Quinn (HQ) and Akaike (AIC).

## 2. Data

For our analysis of the cryptocurrency Bitcoin, we elected to use the daily closing prices of the Bitcoin Coindesk Index for our data. The data is available to the public at [www.coindesk.com/price](http://www.coindesk.com/price). The sample accessed was from 22nd April 2014 to 31st May 2018. As such, the data from the 1st June 2018 to 28th September 2018 can be used for future research as an out-of-sample data set for the evaluation of the forecasting properties of the optimal model within both VaR and ES frameworks. However, an examination of the runtimes for the higher-state estimations meant that an academically rigorous forecasting exercise for the seven MRS models was beyond the scope of this paper.

Since Bitcoin is traded seven days a week, the data set contained 1,501 observations. The data was plotted to check for outliers and the date stamp of each observation was examined for any repetition within the set. To limit the impact of outliers in our data, we examined the daily returns of the sample within a logarithmic framework. Using the downloaded closing price data, as measured at 00:00 UTC each day, daily log returns were found by taking the natural logarithm of the ratio of two consecutive closing prices. The new sample set of log returns contained 1,500 observations. Table 1 presents the summary statistics for the sample of daily log returns for Bitcoin. A kurtosis value of 8.284923 indicated the presence of non-normal leptokurtic behavior. Figures 1, 2 and 3 (overleaf) illustrate

respectively the daily closing price, the daily log returns and the frequency distribution of daily log returns for the Bitcoin Coindesk Index sample.

Table 1. Summary statistics for Bitcoin (23<sup>rd</sup> April 2014 to 31<sup>st</sup> May 2018)

Statistic	Daily log returns
Observations	1,500
Mean	0.001825
Median	0.001820
Maximum	0.226412
Minimum	-0.247132
Standard Deviation	0.038714
Skewness	-0.281471
Kurtosis	8.284923
VaR 1% (loss)	11.6309%
VaR 5% (loss)	6.4756%

Jarque-Bera (JB) and the more powerful Kolmogorov-Smirnov (KS) tests were applied and the null hypotheses of a normally distributed sample were strongly rejected at the 1% significance level for both tests. The unit root tests, Augmented Dickey-Fuller (ADF) and Phillips-Peron (PP), were conducted and the null hypotheses of a unit root in the returns were rejected in both tests at the 1% significance level, indicating that stationarity was present. The results of the tests on the sample are presented in Table 2.

Table 2. Summary statistics for Bitcoin (23<sup>rd</sup> April 2014 to 31<sup>st</sup> May 2018)

Test	Score (significance)
Jarque-Bera	1,765.457***
KS	0.44861***
ADF	-38.22321***

Note: \* significance at 10% level, \*\* significance at 5% level and \*\*\* significance at 1% level.

Figure 1. Daily closing price, Bitcoin Coindesk Index (22<sup>nd</sup> April 2014 to 31<sup>st</sup> May 2018)

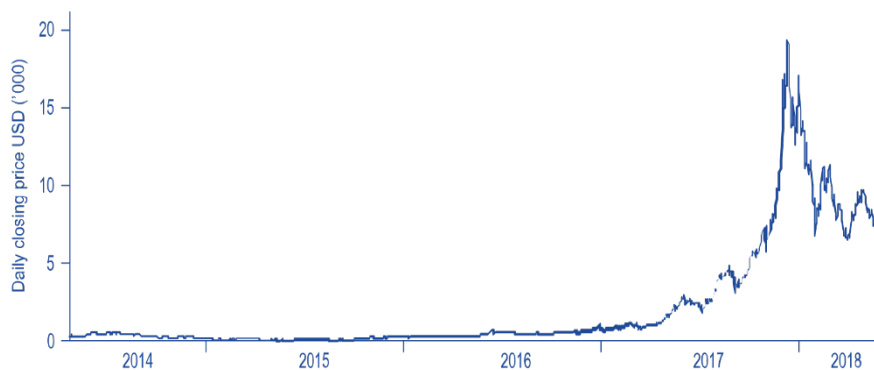


Figure 2. Daily log returns, Bitcoin Coindesk Index (23<sup>rd</sup> April 2014 to 31<sup>st</sup> May 2018)

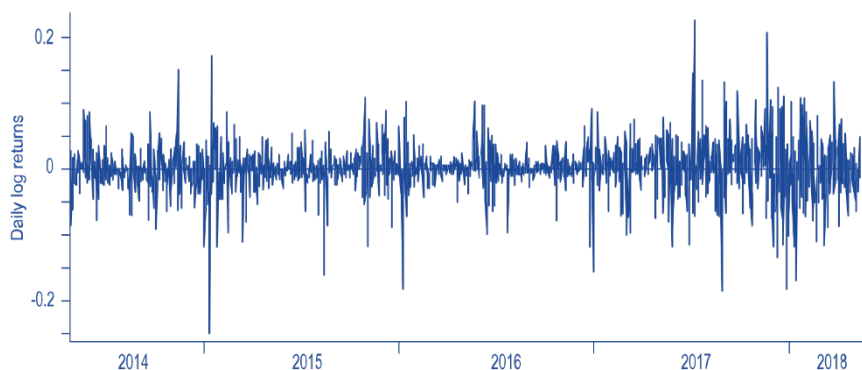
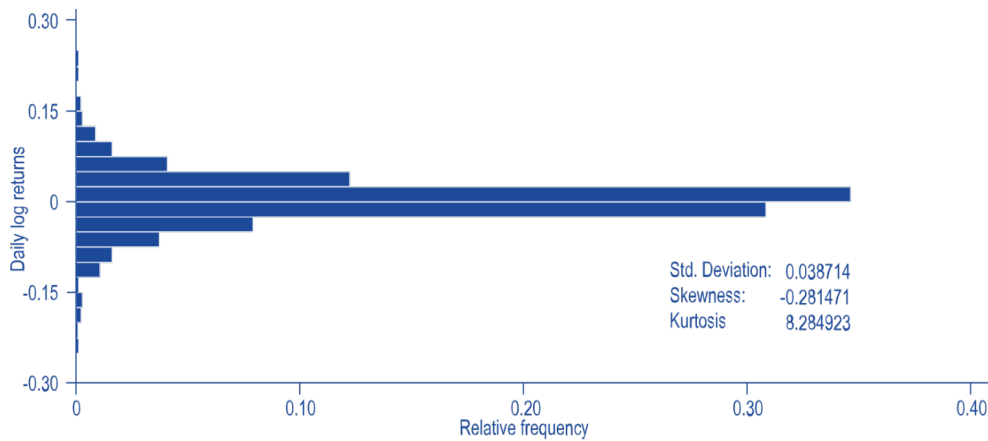


Figure 3. Frequency distribution of daily log returns (23<sup>rd</sup> April 2014 to 31<sup>st</sup> May 2018)



### 3. Methodology

Markov regime switching models reflect the structural changes in the behavior of a hidden process that motivates a sequence of regime heterogeneous observations. Such changes in behavior can occur abruptly and the duration for which the new behavior persists is generally unknown *ab intra*. MRS models are a special form of dependent mixture model, consisting of two parts: an unobserved  $M$ -state Markov process, with  $M \in \{2, 3, 4, \dots\}$ , and an observable state-dependent process. For detailed derivations of the following results consult (Hamilton 1989), (Hamilton 1994) and (Kim 1994).

#### Markov chains and the transition probability matrix, $P_M$

Let  $S_t$  be a random variable appertaining to the unobserved state occupied by a process  $y_t = \mu_{t,m} + \sigma_{t,m}\varepsilon_t$ , where both  $\mu_t$  and  $\sigma_t$  are state-dependent,  $\varepsilon_t$  is *i.i.d.* standard normally distributed and  $M \in \{1, \dots, M\}$ . Then, the value  $p_{ij}(t)$  is the probability of the process occupying State  $j$  at time  $t$  given the process previously occupied State  $i$  in the prior period, where  $i, j \in \{1, \dots, M\}$ . We can write  $p_{ij}(t) = \text{Prob}(S_t = j \mid \xi_t)$ , where  $\xi_t$  is a filtration for the random variable  $S_t$  and includes  $S_{t-1} = i$  for the prior realization. The first-order Markov assumption necessitates that the value  $p_{ij}$  is memoryless and depends solely on the most recent realization of the random variable, *i.e.*  $S_{t-1}$ , therefore,  $p_{ij}(t) = \text{Prob}(S_t = j \mid S_{t-1} = i)$ . For simplicity, we assume our Markov process possesses constant transition probabilities, that is,  $p_{ij}(t) = p_{ij}$ , where  $t \in \{1, \dots, T\}$ .

For such a time-invariant, first-order  $M$ -state Markov chain, we can construct an  $(M \times M)$  transition probability matrix,  $P_M$ , where the  $j$ th row,  $i$ th column entry corresponds to the fixed probability of transitioning from State  $i$  to State  $j$ , or  $p_{ij}$  (as defined above), note some authors transpose the transition probability matrices:

$$P_M = \begin{bmatrix} p_{11} & p_{21} & \dots & p_{m1} \\ p_{21} & p_{22} & \dots & p_{m2} \\ \vdots & \vdots & \ddots & \vdots \\ p_{1m} & p_{2m} & \dots & p_{mm} \end{bmatrix} \tag{1}$$

where:  $M \in \{1, \dots, M\}$ . Within the transition probability matrix,  $P_M$ , each column  $i$  specifies a complete set of conditional probabilities, *i.e.*:

$$\sum_{j=1}^M p_{ij} = 1 \tag{2}$$

where:  $i \in \{1, \dots, M\}$ .

According to (Hamilton 1994) the transition probabilities can be parameterized via a multinomial logit function, with a specific function for each column  $i$  of  $P_M$ .

#### Maximum likelihood (ML) and filtered regimes probabilities

The log-likelihood function may be maximized through iteration for several parameters, including the regime probabilities and is evaluated recursively:

$$\mathcal{L}(\theta) = \sum_{t=1}^M \log \left\{ \sum_{m=1}^M \frac{1}{\sigma_m} \phi \left( \frac{y_t - \mu_{t,m}}{\sigma_m} \right) \cdot \text{Prob}(S_t = m \mid \xi_{t-1}, \delta) \right\} \quad (3)$$

Each recursive step starts with the filtered estimates of the previous period's regime probabilities. The recursion requires the determination of the one-step ahead forecasts of the regime probabilities, that are then used to discern the one-step ahead joint densities. Finally, the marginal distribution of the observed data is computed by summing the joint probabilities across the unobserved states. The results are filtered by recursively updating the one-step ahead forecasts. The process requires the initial regime probabilities be populated, *i.e.*  $\text{Prob}(S_0 = M \mid \xi_0)$ .

#### Initial filtered regime probabilities

There are several options available for populating the initial filtered regime probabilities at  $t = 0$ : user specified, uniform, estimated or steady state. For our analysis, we choose the latter and assume that the filtered regime probabilities are functions of the parameters that generate the transition probability matrix. We utilize 200 sets of random starting value estimations and 50 iteration refinements with a convergence tolerance of  $1e-5$ .

#### Smoothed regime probabilities

The estimates of the filtered regime probabilities are improved by applying a full sample smoother algorithm (Kim 1994). This technique uses all of the sample information,  $\xi_T$ , and not just the contemporaneous information contained up to the observation at time  $t$  itself,  $\xi_t$ . The algorithm's *raison d'être* pertains to the fact that smoothed and *ex-post* probabilities are equal for the last observation. As such, a sole backward recursion through the sample is performed, for all  $t \in \{T-1, \dots, 1\}$ , with the initial values set as  $\text{Prob}(S_T = j \mid \xi_T)$ , with  $j \in \{1, \dots, M\}$ . The improved estimates for the smoothed regime transitions are a result of the Markov transition probabilities connecting the likelihood of observations from different instances. The algorithm reduces the number of necessary computations from a function of  $T^2$  to a function of  $T$  (Kim 1994).

#### Transition restriction matrix, $R_M$

If an entry of  $P_M$  is approximately zero after the initial estimation, *i.e.*  $p_{ij} \approx 0$ , then the model is re-estimated to improve sample fit. The re-estimation is conducted in a constrained manner using an  $(M \times M)$  transition restriction matrix,  $R_M$ , and will determine a revised transition probability matrix,  $P^*_M$ . The entries of  $R_M$  adhere to the following distribution, where  $\varphi$  implies that the transition probability is free to be re-estimated and  $i, j \in \{1, \dots, M\}$ :

$$r_{ij} = \begin{cases} 0, & \text{if } p_{ij} \approx 0 \\ \varphi, & \text{if } p_{ij} \neq 0 \end{cases} \quad (4)$$

Similar to  $P_M$ , each column of  $R_M$  must contain a full set of conditional probabilities to be correctly specified:

$$\sum_{j=1}^M r_{ij} = 1 \quad (5)$$

for all  $i \in \{1, \dots, M\}$ .

#### Covariance-stationarity and forecasting

A Markov chain is *reducible* if the entry  $p_{ii}$  of the matrix  $P_M$  is equal to unity, since all other entries in the  $i$ th column,  $p_{ij}$ , where  $(i \neq j) \leq M$ , will be zero. Thus, State  $i$  is an *absorbing state*. That is, once State  $i$  has been occupied there is no possibility of returning to any other state. The converse of which is an *irreducible* Markov chain, where the probability  $p_{ii} < 1$ , for all  $i \in \{1, \dots, M\}$ . An *ergodic*  $M$ -state irreducible Markov chain with the transition probability matrix  $P_M$ , has one eigenvalue equal to unity, since  $P'_M \cdot 1 = 1$ , where  $1$  is an  $(M \times 1)$  vector of 1's, *i.e.*  $[1_1, 1_2, \dots, 1_M]'$ . All other eigenvalues for the transition probability matrix will lie within the unit circle. Such a Markov chain is *covariance-stationary* (Hamilton 1994), and thus an  $n$ -interval ahead forecast can be computed by simply considering  $n$  multiples of  $P_M$ . That is,  $\text{Prob}(S_{t+n} = j \mid S_t = i)$  is the  $j$ th row,  $i$ th column entry of  $(P_M)^n$ .

#### Autocorrelation and nonsequential regime switches

For a 2-state Markov chain, if  $p_{11} + p_{22} > 1$  the process is likely to persist in the current state. As such, the process is likely to exhibit positive serial correlation, which given our application translates to volatility clustering. Conversely, if  $p_{11} + p_{22} < 1$  the process will likely exhibit negative serial correlation. For a set of  $M$  states, with  $M \in \{3, 4, \dots\}$ , that are ordinal with respect to the standard deviation of log returns per state; nonsequential regimes

switches manifest as nonzero transition probabilities of the form  $p_{ik}$ , where  $|i - k| > 1$  for all  $i, k \in \{1, \dots, M\}$ , for example  $p_{13}$ ,  $p_{42}$  or  $p_{31}$ .

#### Information criterion

In order to judge the goodness-of-fit of each single regime model, three information criteria were used, namely the Bayesian Information Criterion (BIC), the Akaike Information Criterion (AIC) and the Hannan-Quinn Information Criterion (HQC). For reporting the goodness-of-fit in this paper, we negated the information criteria test statistics. Thus, the highest score intuitively corresponds to the optimal model.

### 4. Empirical results

We first consider the goodness-of-fit scores for the unrestricted MRS estimations.

#### 4.1. Goodness-of-fit results

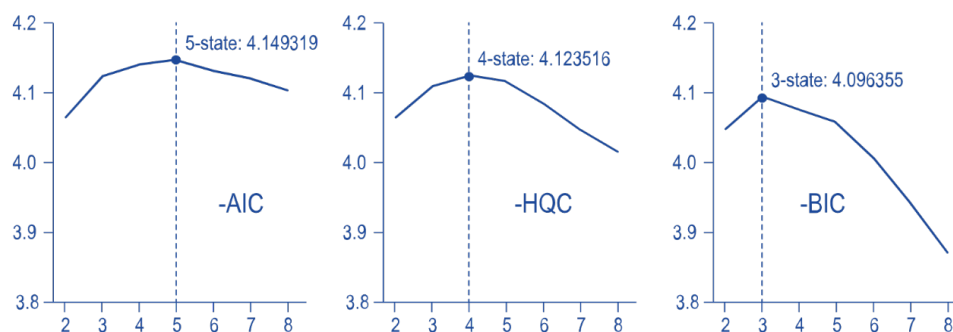
The six  $M$ -state MRS models, where  $M \in \{2, \dots, 7\}$ , were initially estimated without the use of a transition restriction matrix. The results of which are presented in Table 3 and Figure 4. The goodness-of-fit scores for the unrestricted estimations indicated that the optimal model for capturing the regime heteroskedasticity of Bitcoin differed depending upon which information criterion was referenced. The higher state models did not fit the data as well as the lower state models and there was a marked drop in the goodness-of-fit scores once the optimal model had been identified for each of the three information criteria.

Table 3. Unrestricted goodness-of-fit scores

Estimation	-AIC	-HQC	-BIC
2-state	4.067042	4.061763	4.052873
3-state	4.128235	4.116358	<b>4.096355</b>
4-state	4.144630	<b>4.123516</b>	4.087955
5-state	<b>4.149319</b>	4.116330	4.060765
6-state	4.130433	4.082928	4.002916
7-state	4.122400	4.057740	3.948834
8-state	4.102808	4.018355	3.875111

For completeness, we included the unrestricted estimation of an 8-state MRS model to confirm the downward trend in the goodness-of-fit scores for the higher state models. In addition, the estimation of the 6- and 7-state models indicated over fitting of the data, due to the presence of both absorbing and redundant states.

Figure 4. Unrestricted goodness-of-fit scores versus number of states (-AIC, -HQC, -BIC)



As such, the 3-, 4- and 5-state models were re-estimated using a transition restriction matrix for each model, whilst the unrestricted 2-state MRS estimation was carried forward for comparison with the aforementioned restricted estimation. It should be noted that the 2-state model cannot be re-estimated in a restricted manner, as this would nonsensically imply that either State 1 and/or State 2 were absorbing states according to the distribution of  $r_{ij}$  in  $R_M$ .

Table 4 and Figure 5 present the goodness-of-fit scores for the unrestricted 2-state model and the three restricted estimations, *i.e.* the 3-, 4-, and 5-state MRS models. Once the latter models had been fitted in a restricted manner, the results of the three information criteria homogenized to unanimously indicate that the restricted 5-state model was optimal for capturing the regime heteroskedasticity of Bitcoin.

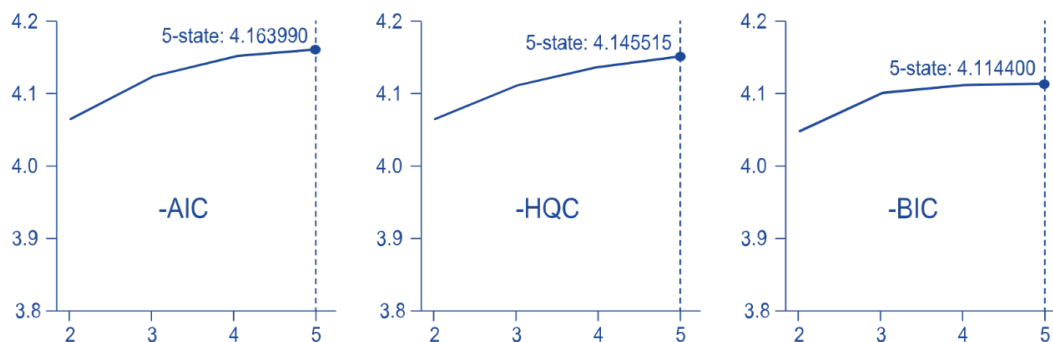
The remainder of this section presents in-depth results for the 2-, 3-, 4- and 5-state MRS models, this may be skipped as any pertinent findings are amalgamated into the following section for discussion. For each estimation, we state the following elements:

- the standard deviations for each state (volatility regime);
- an unrestricted transition matrix;
- a transition restriction matrix;
- a graphical representation of the transition probabilities;
- the probability transition graphs for each state; and finally
- the estimation's goodness-of-fit scores (negated information criteria test statistics).

Table 4. Restricted goodness-of-fit scores

Estimation	-AIC	-HQC	-BIC
2-state (unrestricted)	4.067042	4.061763	4.052873
3-state	4.129568	4.119011	4.101231
4-state	4.151296	4.136781	4.112338
5-state	<b>4.163990</b>	<b>4.145515</b>	<b>4.114400</b>

Figure 5. Restricted goodness-of-fit scores versus number of states (-AIC, -HQC, -BIC)



#### 4.2. 2-state MRS estimation results

The standard deviations of the High and Low volatility regimes for the 2-state estimation are listed in Table 5, whilst Matrix 1 presents the transition probability matrix for the model. The latter indicated the presence of volatility clustering in the price data of Bitcoin for the 2-state model, as demonstrated by the high likelihood for each state to remain in the same state in the following interval. That is, a High (Low) volatility observation is typically followed by a subsequent High (Low) volatility observation. Trivially, there was no requirement for the 2-state model to be re-estimated with a transition restriction matrix applied, since none of the transition probabilities had near-zero values.

Table 5. Standard deviations for the volatility regimes (2-state MRS)

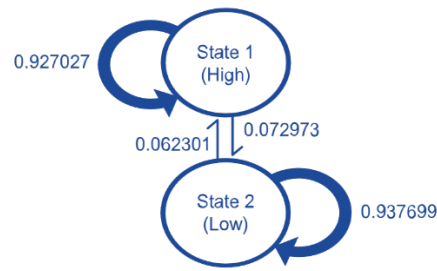
1 (High)	2 (Low)
0.054406	0.016122

Matrix 1 - Unrestricted transition probability matrix (2-state MRS):

$$P_2 = \begin{bmatrix} 0.927027 & 0.062301 \\ 0.072973 & 0.937699 \end{bmatrix} \tag{6}$$

A graphical representation of the transition probabilities presented in Matrix 1 is shown in Figure 6. The thickness of the line for each transition is reflective of the degree of probability for that transition to occur for the following interval.

Figure 6. Unrestricted transition probability diagram (2-state MRS)



Figures 7 and 8 illustrate the probability transitions for the 2-state MRS estimation, note the high probability of being in State 1 (High volatility regime) from September 2017 to March 2018, a period which covered the bubble and subsequent crash in the price of Bitcoin. Table 6 presents the goodness-of-fit scores for the 2-state estimation. We have negated the information criteria test statistics. As such, the optimal model will present with the highest goodness-of-fit scores.

Figure 7. High state estimation probability transition graph (2-state MRS)

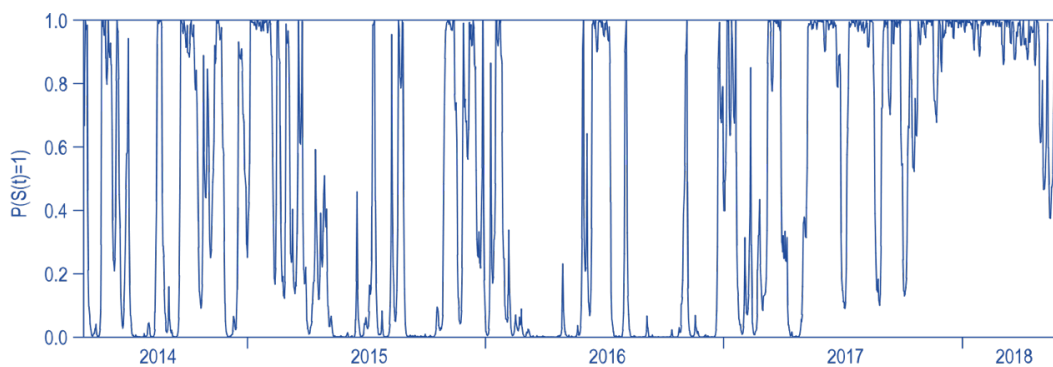


Figure 8. Low state estimation probability transition graph (2-state MRS)

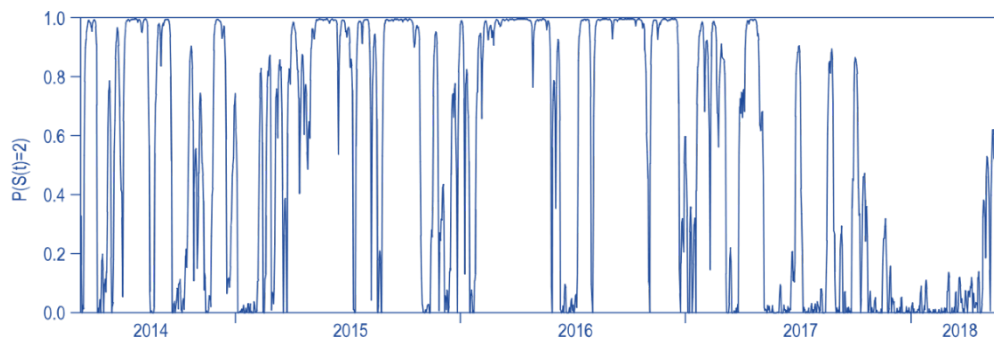


Table 6. Goodness-of-fit scores (2-state MRS)

Estimation	-AIC	-HQC	-BIC
Unrestricted	4.067042	4.061763	4.052873

### 4.3. 3-state MRS estimation results

The standard deviations of the High, Medium and Low volatility regimes for the 3-state estimation are presented below in Table 7, whilst Matrix 2 presents the transition probability matrix for the model. Again, there is evidence of volatility clustering in the price data of Bitcoin. In addition, the near-zero transition probability from the High state to the Low state in Matrix 2, indicated that the model would need to be re-estimated using a transition restriction matrix. As such, a 3 x 3 matrix  $R_3$  (Matrix 3) was constructed with the  $r_{13}$  entry set to zero (0). All other transition probabilities were free to be re-estimated.

Table 7. Standard deviations for the volatility regimes (3-state MRS)

1 (High)	2 (Medium)	3 (Low)
0.061261	0.026304	0.010667



Matrix 2 - Unrestricted transition probability matrix (3-state MRS):

$$P_3 = \begin{bmatrix} 0.923720 & 0.047742 & 0.015154 \\ 0.076280 & 0.906351 & 0.057529 \\ 6.04E-14 & 0.045907 & 0.927317 \end{bmatrix} \tag{7}$$

Matrix 3 - Restricted transition matrix (3-state MRS):

$$R_3 = \begin{bmatrix} \varphi & \varphi & \varphi \\ \varphi & \varphi & \varphi \\ 0 & \varphi & \varphi \end{bmatrix} \tag{8}$$

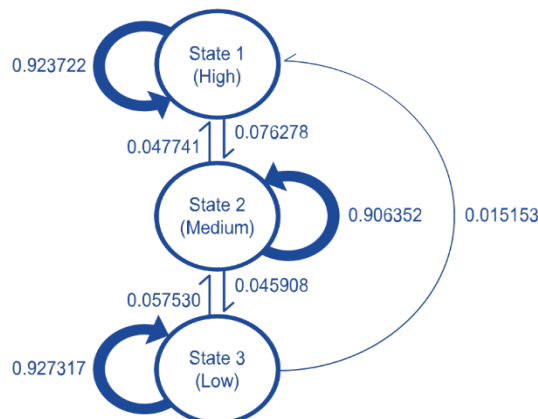
Matrix 4 states the revised transition probabilities for the restricted 3-state MRS model.

Matrix 4 - Restricted transition probability matrix (3-state MRS):

$$P_3^* = \begin{bmatrix} 0.923722 & 0.047741 & 0.015153 \\ 0.076278 & 0.906352 & 0.057530 \\ 0 & 0.045908 & 0.927317 \end{bmatrix} \tag{9}$$

Figure 9 is a graphical representation of the transition probabilities presented in Matrix 4. The diagram indicates that the volatility of Bitcoin can “jump” from the Low state to the High state, with a probability of 1.5153% under the 3-state MRS model.

Figure 9. Restricted transition probability diagram (3-state MRS)



Figures 10-12 illustrate the probability transitions for the 3-state MRS estimation. The most notable feature is the very low probability of transitioning to the Low volatility regime in the last 12 months of the sample, a time which pertained to the bubble and subsequent crash of Bitcoin’s price (Figure 12).

Figure 10. High state estimation probability transition graph (3-state MRS)

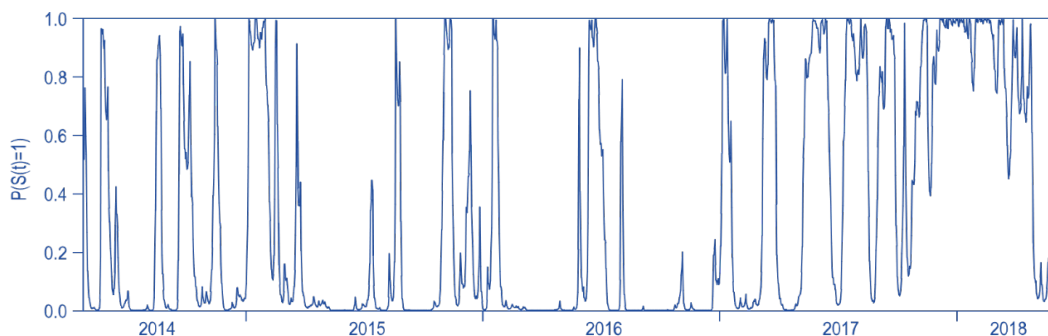


Figure 11. Medium state estimation probability transition graph (3-state MRS)

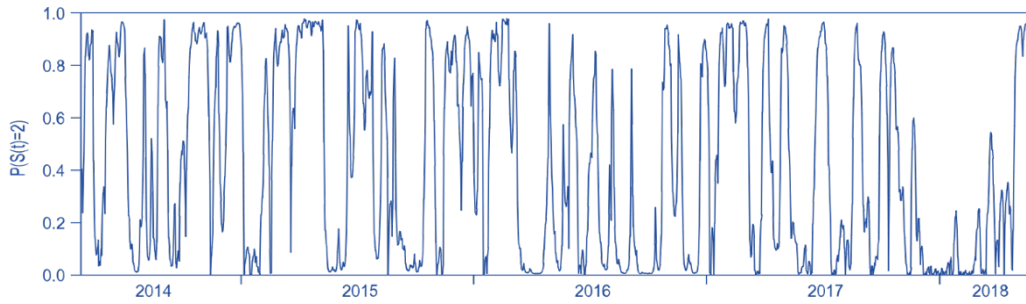


Figure 12. Low state estimation probability transition graph (3-state MRS)

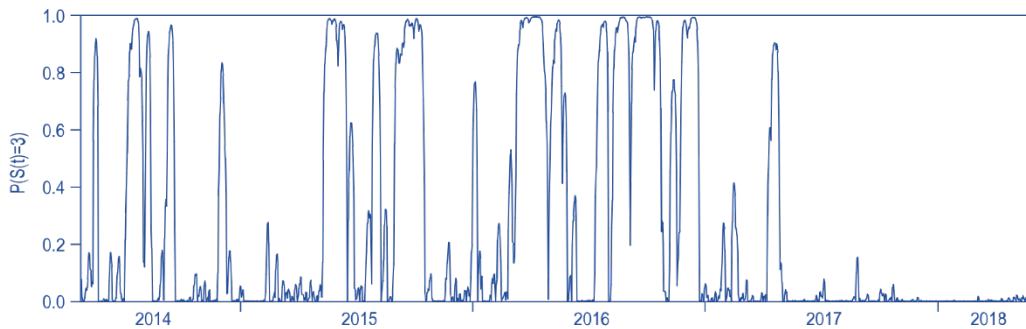


Table 8 confirms that the application of a transition restriction matrix to the 3-state MRS estimation was the optimal decision. The resultant goodness-of-fit scores for the restricted estimation were higher than the scores for the unrestricted estimation with regard to all three of the negated information criteria.

Table 8. Goodness-of-fit scores (3-state MRS)

Estimation	-AIC	-HQC	-BIC
Unrestricted	4.128235	4.116358	4.096355
Restricted	<b>4.129568</b>	<b>4.119011</b>	<b>4.101231</b>

#### 4.4. 4-state MRS estimation results

Tables 9 and Matrix 5 respectively present the restricted standard deviations for the volatility regimes and the initial unrestricted transition probabilities estimated with the 4-state MRS model ( $P_4$ ). Due to a number of near-zero values in the transition probability matrix, we constructed a transition restriction matrix  $R_4$ , see Matrix 6, and re-estimated the 4-state MRS model. See Matrix 7 for the revised restricted transition probabilities,  $P^*_4$ .

Table 9. Standard deviations for the volatility regimes (4-state MRS)

1 (High)	2 (Medium)	3 (Low+)	4 (low-)
0.063167	0.027787	0.017941	0.006103

Matrix 5 - Unrestricted transition probability matrix (4-state MRS):

$$P_4 = \begin{bmatrix} 0.907850 & 0.055149 & 2.36E-78 & 0.026147 \\ 0.092150 & 0.914608 & 4.09E-07 & 0.049639 \\ 8.1E-129 & 0.030243 & 0.499295 & 0.392787 \\ 6.0E-124 & 3.8E-129 & 0.500705 & 0.531426 \end{bmatrix} \tag{10}$$

Matrix 6 - Transition restriction matrix (4-state MRS):

$$R_4 = \begin{bmatrix} \varphi & \varphi & 0 & \varphi \\ \varphi & \varphi & 0 & \varphi \\ 0 & \varphi & \varphi & \varphi \\ 0 & 0 & \varphi & \varphi \end{bmatrix} \tag{11}$$

Matrix 7 - Restricted transition probability matrix (4-state MRS):

$$P_4^* = \begin{bmatrix} 0.907860 & 0.055150 & 0 & 0.026127 \\ 0.092140 & 0.914587 & 0 & 0.049749 \\ 0 & 0.030263 & 0.499562 & 0.392775 \\ 0 & 0 & 0.500438 & 0.531349 \end{bmatrix} \quad (12)$$

As with the 2- and 3-state models, the 4-state MRS estimation also exhibited volatility clustering, although to a lesser degree for the lower volatility regimes. In addition, we identified two nonsequential jumps in the 4-state model pertaining to upward shocks in volatility. In contrast, all of the volatility transition that related to a decrease in volatility were identified solely as transitions between adjacent states. As such, the 4-state model also demonstrated an asymmetric tendency in the volatility transitions between regimes. Figure 13 illustrates the transition probabilities of  $P_4^*$ . Table 10 presents the goodness-of-fit scores for both runs of the model, namely the unrestricted and restricted estimations. As can clearly be seen, the unrestricted 4-state estimation generated inferior goodness-of-fit scores as compared to the restricted estimation. As such, the application of a transition restriction matrix to the 4-state model was considered justified.

Table 10. Goodness-of-fit scores (4-state MRS)

Estimation	-AIC	-HQC	-BIC
Unrestricted	4.144630	4.123516	4.087955
Restricted	<b>4.151296</b>	<b>4.136781</b>	<b>4.112338</b>

Figures 14-17 present the estimation probability transition graphs for the four states of the restricted MRS model. The probability of transitioning to either of the low volatility regimes during the bubble and subsequent crash of 2017-18 was considered highly unlikely.

Figure 13. Restricted transition probability diagram (4-state MRS)

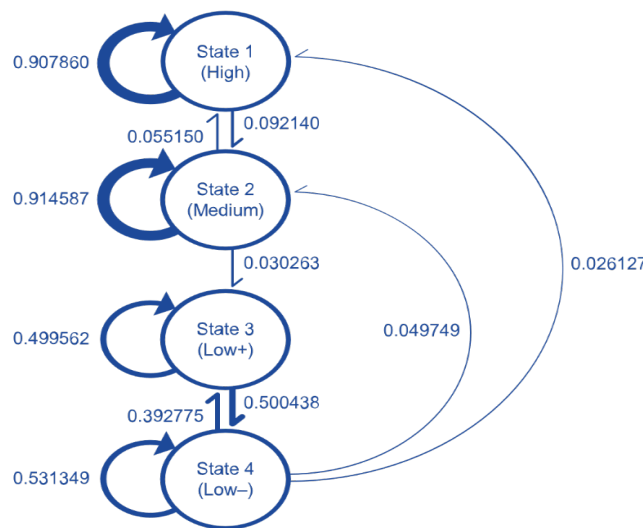


Figure 14. High state estimation probability transition graph (4-state MRS)

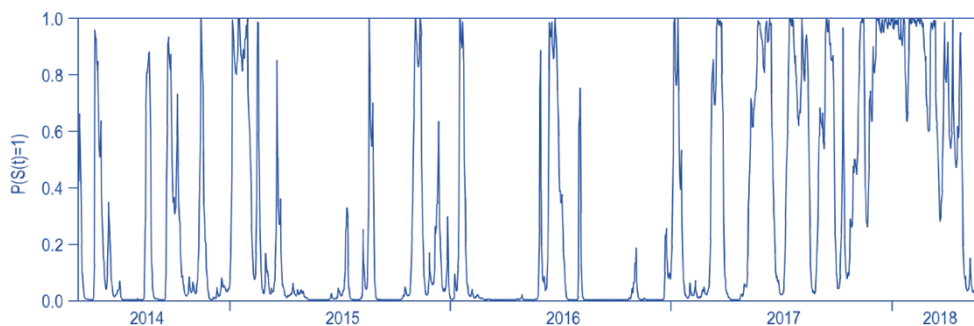


Figure 15. Medium state estimation probability transition graph (4-state MRS)

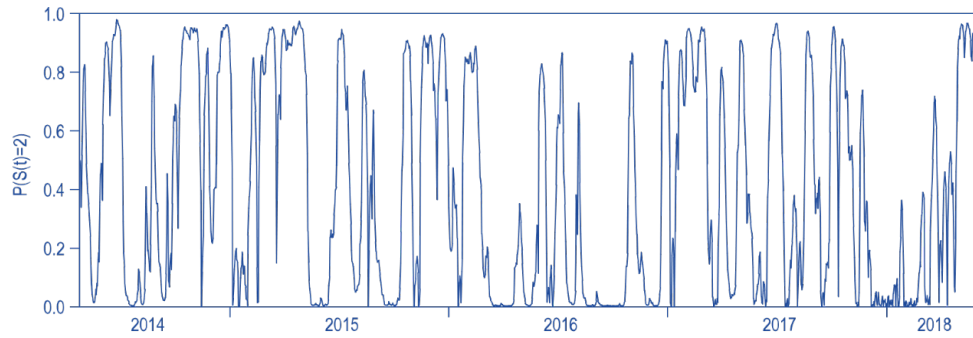


Figure 16. Low+ state estimation probability transition graph (4-state MRS)

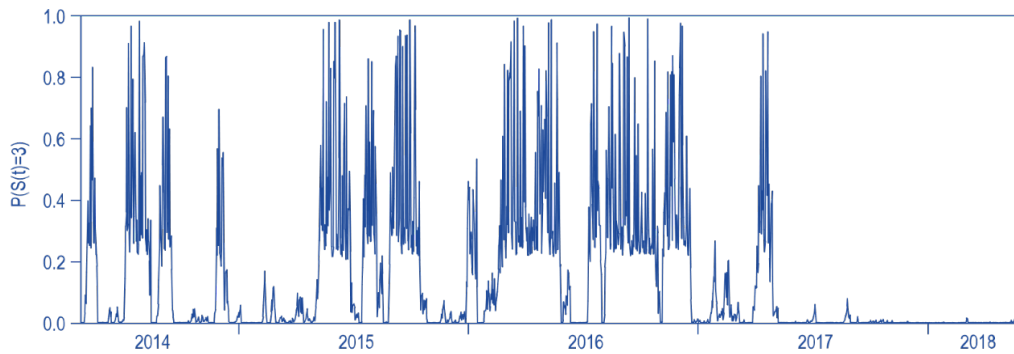
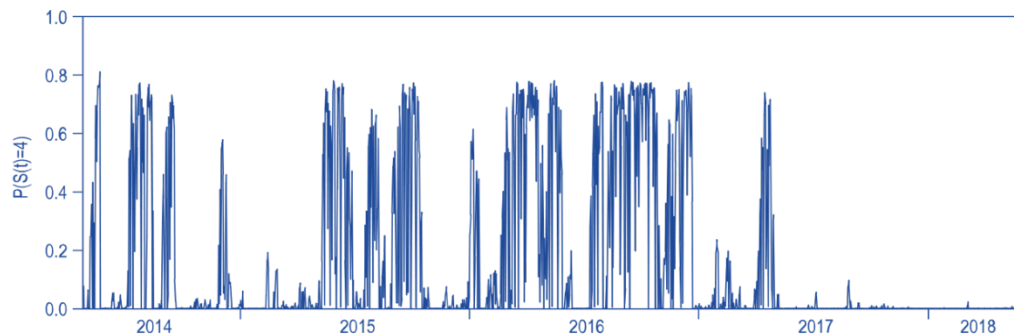


Figure 17. Low- state estimation probability transition graph (4-state MRS)



#### 4.5. 5-state MRS estimation results

Table 11 presents the restricted standard deviations for the volatility regimes of the 5-state MRS estimation, whilst Matrix 8 presents the transition probabilities from the unrestricted estimation of the model.

Table 11. Standard deviations for the volatility regimes (5-state MRS)

1 (high)	2 (Medium+)	3 (Medium-)	4 (Low+)	5 (low-)
0.061895	0.041963	0.017825	0.016564	0.005446

Matrix 8 - Unrestricted transition probability matrix (5-state MRS):

$$\mathbf{P}_5 = \begin{bmatrix} 0.951512 & 3.72\text{E-}11 & 0.042213 & 0.010137 & 3.36\text{E-}07 \\ 0.048468 & 0.275730 & 0.370726 & 0.069137 & 6.89\text{E-}06 \\ 1.22\text{E-}07 & 0.724270 & 0.547947 & 6.97\text{E-}19 & 2.50\text{E-}09 \\ 1.94\text{E-}05 & 7.09\text{E-}09 & 0.039114 & 0.500808 & 0.469091 \\ 2.89\text{E-}09 & 1.08\text{E-}21 & 6.23\text{E-}26 & 0.419919 & 0.530902 \end{bmatrix} \tag{13}$$

Matrix 9 - Restricted transition matrix (5-state MRS):

$$R_5 = \begin{bmatrix} \varphi & 0 & \varphi & \varphi & 0 \\ \varphi & \varphi & \varphi & \varphi & 0 \\ 0 & \varphi & \varphi & 0 & 0 \\ 0 & 0 & \varphi & \varphi & \varphi \\ 0 & 0 & 0 & \varphi & \varphi \end{bmatrix} \tag{14}$$

Due to a number of near-zero values in the transition probability matrix  $P_5$ , we constructed the transition restriction matrix  $R_5$  (Matrix 9) and re-estimated the 5-state MRS model in a restricted manner. Matrix 10 presents the resultant restricted transition probabilities,  $P_5^*$ . Figure 16 illustrates the transition probabilities of this matrix.

Matrix 10 - Restricted transition probability matrix (5-state MRS):

$$P_5^* = \begin{bmatrix} 0.951523 & 0 & 0.042013 & 0.010289 & 0 \\ 0.048477 & 0.270008 & 0.369916 & 0.069118 & 0 \\ 0 & 0.729992 & 0.548948 & 0 & 0 \\ 0 & 0 & 0.039123 & 0.499691 & 0.469132 \\ 0 & 0 & 0 & 0.420901 & 0.530868 \end{bmatrix} \tag{15}$$

As with the previous estimations of the 2-, 3- and 4-state MRS models, the results of 5-state MRS estimation indicated a degree of persistence in some of the states. States 1, 3 and 5 all indicated to varying degrees, that an observation in either of these three states would typically remain in the same state in the following interval. As such, the 5-state MRS model also provided evidence to the presence of volatility clustering in the price data of Bitcoin. Additionally, the 5-state MRS estimation also exhibited volatility clustering, although to a lesser degree for the lower volatility regimes. The 5-state model also demonstrated an asymmetric tendency in the volatility transitions between regimes. Given the level of persistence in the two higher volatility regimes, any volatility shocks from States 3 or 4 to States 1 or 2, could have required a number of subsequent intervals in order to correct. Figures 19-23 illustrate the probability transitions for the 5-state MRS estimation.

Figure 18. Restricted transition probability diagram (5-state MRS)

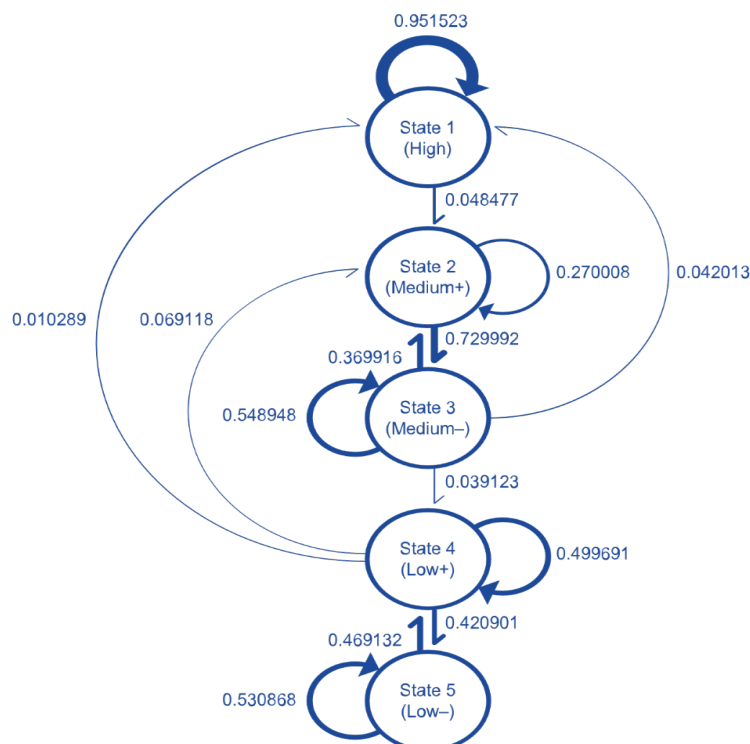


Figure 19. High state estimation probability transition graph (5-state MRS)

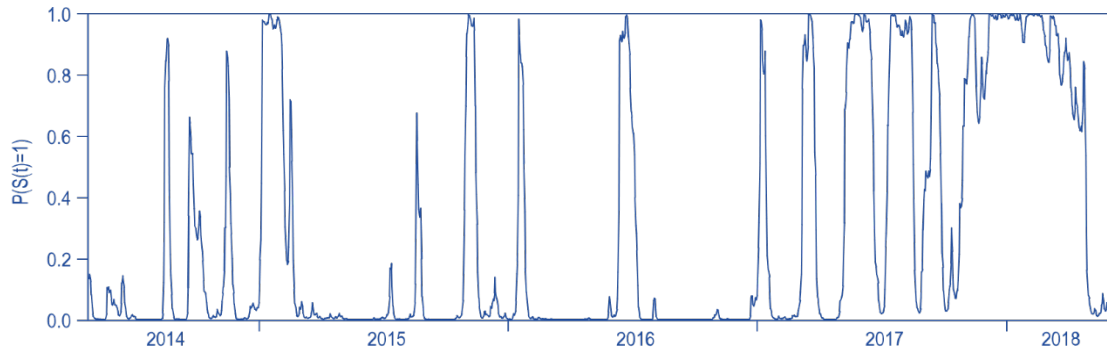


Figure 20. Medium+ state estimation probability transition graph (5-state MRS)

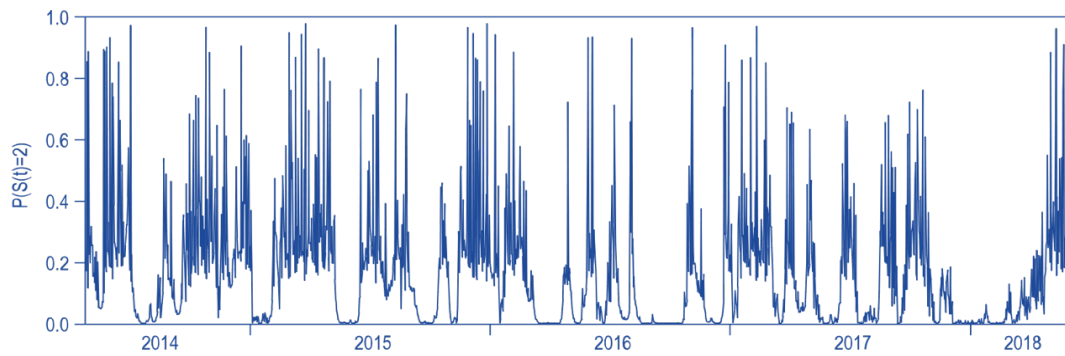


Figure 21. Medium- state estimation probability transition graph (5-state MRS)

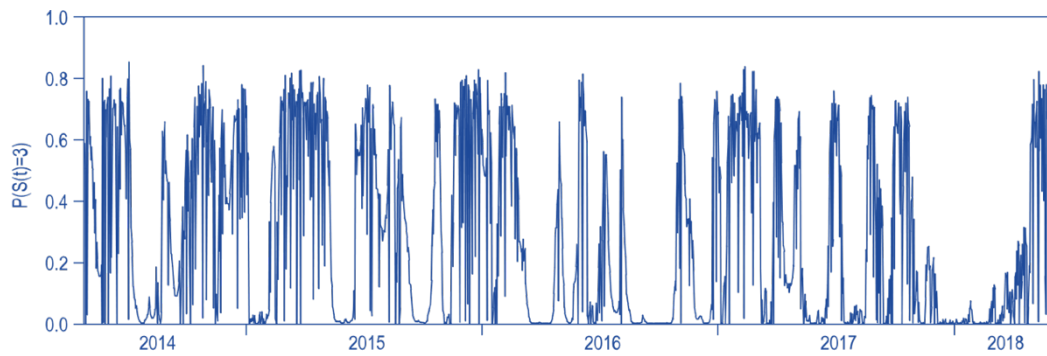


Figure 22. Low+ state estimation probability transition graph (5-state MRS)

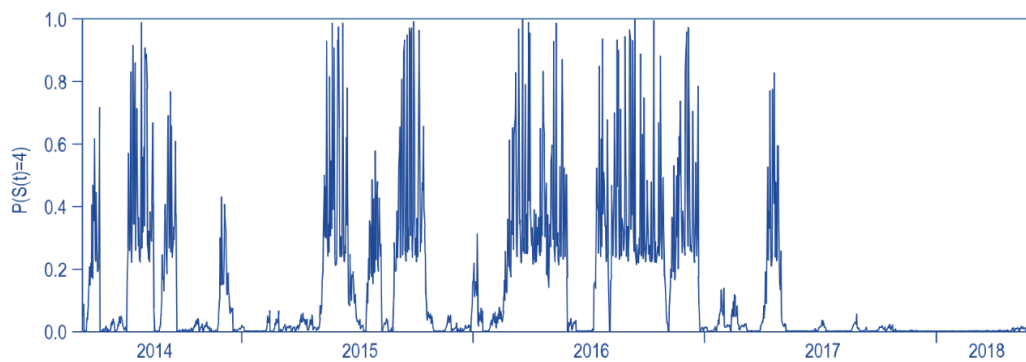
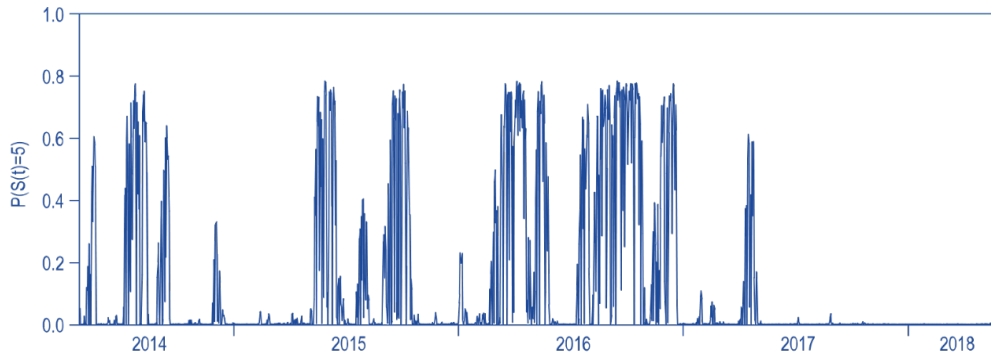


Figure 23. Low- state estimation probability transition graph (5-state MRS)



Overall, the 5-state MRS estimate with a restrictive transition matrix resulted in the highest goodness-of-fit scores for all estimations. The specific scores for the 5-state model are presented in Table 12.

Table 12. Goodness-of-fit scores (5-state MRS)

Estimation	-AIC	-HQC	-BIC
Unrestricted	4.14319	4.116330	4.060765
Restricted	<b>4.163990</b>	<b>4.145515</b>	<b>4.114400</b>

## 5. Discussions

### Optimal state space

As indicated in the previous section, the optimal MRS estimation for capturing the regime heteroskedasticity of Bitcoin was the restricted 5-state MRS model. The regime dimensionality of an effective MRS model, however, is reduced significantly when a second model (GARCH) is embedded within the MRS framework (Ardia *et al.* 2018). Since such a model specifically addresses both the regime heteroskedasticity and the autocorrelation of the second moment. Therefore, indicating that the MRS model is an ideal framework for capturing the regime heteroskedasticity of Bitcoin, but not for modelling the serial correlation of the cryptocurrency's variance.

Examining the final transition probability matrices,  $P_2$  for the 2-state model and  $P^*_3$ ,  $P^*_4$  and  $P^*_5$  otherwise; we find consistent evidence of a variety of dynamic nonlinear characteristics in the data, namely volatility clustering, nonsequential regime switches, asymmetric regime switches and the persistence of shocks.

### Volatility clustering

Evidence of positive autocorrelation in volatility; a high (low) volatile interval being followed by a subsequent high (low) volatile interval, is present in many of the qualifying transition probabilities,  $p_{ii}$  or  $p^*_{ii}$  with  $i \in \{1, \dots, M\}$ . As the regime dimensionality of the MRS estimation increases, the occurrence of volatility clustering in all bar the highest volatility regimes dissipates. Table 13 presents the qualifying probabilities.

Table 13. Qualifying transition probabilities

Estimation	$p_{11}$ or $p^*_{11}$	$p_{22}$ or $p^*_{22}$	$p^*_{33}$	$p^*_{44}$	$p^*_{55}$
2-state, $p_{ii}$	<b>0.927027</b>	<b>0.937699</b>	-	-	-
3-state, $p^*_{ii}$	<b>0.923722</b>	<b>0.906352</b>	<b>0.927317</b>	-	-
4-state, $p^*_{ii}$	<b>0.907860</b>	<b>0.914587</b>	0.499562	0.531349	-
5-state, $p^*_{ii}$	<b>0.951523</b>	0.270008	0.548948	0.499691	0.530868

### Non-sequential regime switches

The revised 3-, 4- and 5-state MRS estimations indicated the presence of non-sequential regimes switches, specifically the presence of non-zero transition probabilities for some entries  $p^*_{ik}$ , where  $|i - k| > 1$  and  $i, k \in \{1, \dots, M\}$ . More precisely,  $p^*_{31} = 0.015153$  for  $P^*_3$ ,  $p^*_{41} = 0.026127$  and  $p^*_{42} = 0.049749$  for  $P^*_4$  and  $p^*_{31} = 0.042013$ ,  $p^*_{42} = 0.069118$  and  $p^*_{41} = 0.010289$  for  $P^*_5$ .

### Asymmetric regime switches

The transition restriction matrices applied during the revised 3-, 4- and 5-state estimations respectively, each contain a lower triangle of zeros. Although, only trivially in the case of  $R_3$ . The presence of these zeros demonstrated the asymmetric nature of volatility transitions in the historical price data. Upward jumps in volatility did occur in the

form of non-sequential regimes switches as previously stated. Non-sequential drops in volatility, however, did not occur, since all downward non-sequential regimes switches had a zero probability of occurring:  $r_{13}$  for  $R_3$  (Matrix 11),  $r_{13}$ ,  $r_{14}$  and  $r_{24}$  for  $R_4$  (Matrix 12) and  $r_{13}$ ,  $r_{14}$ ,  $r_{15}$ ,  $r_{24}$ ,  $r_{25}$  and  $r_{35}$  for  $R_5$  (Matrix 13). Recall,  $r_{ij}$  is the  $j$ th row,  $i$ th column entry of  $R_M$ .

Matrix 11 - Transition restriction matrix (3-state MRS),  $R_3$ :

$$R_3 = \begin{bmatrix} \varphi & \varphi & \varphi \\ \varphi & \varphi & \varphi \\ 0 & \varphi & \varphi \end{bmatrix} \tag{16}$$

Matrix 12 - Transition restriction matrix (4-state MRS),  $R_4$ :

$$R_4 = \begin{bmatrix} \varphi & \varphi & 0 & \varphi \\ \varphi & \varphi & 0 & \varphi \\ 0 & \varphi & \varphi & \varphi \\ 0 & 0 & \varphi & \varphi \end{bmatrix} \tag{17}$$

Matrix 13 - Transition restriction matrix (5-state MRS),  $R_5$ :

$$R_5 = \begin{bmatrix} \varphi & 0 & \varphi & \varphi & 0 \\ \varphi & \varphi & \varphi & \varphi & 0 \\ 0 & \varphi & \varphi & 0 & 0 \\ 0 & 0 & \varphi & \varphi & \varphi \\ 0 & 0 & 0 & \varphi & \varphi \end{bmatrix} \tag{18}$$

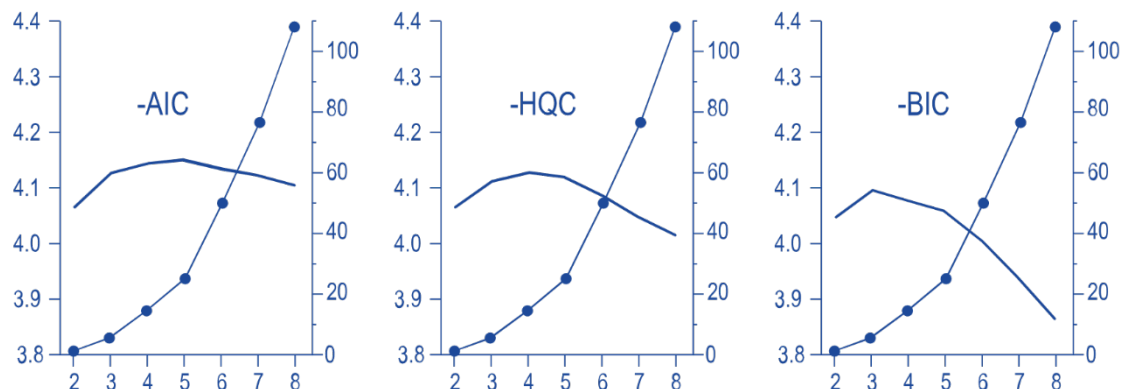
### Persistence of shocks

The asymmetric nature of the volatility transitions coupled with the serial correlation witnessed in the transition probability matrices, indicated that upward shocks in volatility were likely to persist beyond a single subsequent interval. As such, the presence of volatility clustering and jumps, asymmetric regimes switch and the persistence of shocks decay the application of single regime models for capturing the nonlinear volatility dynamics of Bitcoin.

### Unrestricted estimation runtimes

We found that as the complexity of the model increased, the runtime required to complete each estimation increased significantly. This was due to the exponential increase in the number of operations that needed to be completed to account for the increased dimensionality due to each additional state. In making the case for an optimal model, the runtime required to complete the necessary estimation should be of utmost importance, especially in regard to the execution of a rolling forecast exercise. Figure 24 presents the runtimes for the initial unrestricted estimations for the various MRS models, including the aforementioned 8-state model for completeness.

Figure 24. Unrestricted goodness-of-fit scores versus runtime (minutes) (-AIC, -HQC, -BIC)





## Conclusions

We fitted a sample of Bitcoin returns with six  $M$ -state MRS estimations, with  $M \in \{2, \dots, 7\}$ . Our aim was to identify the optimal number of states for modelling the regime heteroskedasticity in the price data of Bitcoin. In doing so, we found that the restricted 5-state Markov regime switching model attained the highest goodness-of-fit scores in our comparative study. However, for each additional state over the simple 2-state model that was estimated, there was an increased complexity in the form of transition restriction matrices and a disproportionate marginal cost in the form of computational runtime. Whilst we did attempt to fit both the 6- and 7-state models to our sample, we found that the estimation results indicated over fitting of the sample, in the form of absorbing states and a redundant regime (State 7). By applying MRS models to the sample, we also found evidence of:

- volatility clustering, high degree of persistence in the 2-, 3- and 4-state estimations;
- volatility jumps, non-sequential transitions in the 3-, 4- and 5-state estimations;
- asymmetric volatility transitions, presence of volatility steps and jumps for increases in volatility, but only volatility steps for decreases in volatility;
- shock persistence, presence of asymmetric volatility transitions, so that upward shocks in the volatility of Bitcoin typically persisted beyond a single interval.

The estimation of conditional heteroskedasticity in the time series of Bitcoin's returns without any consideration for the evident regime heteroskedasticity, is certainly a fool's errand. The application of a 2-state MRS-GARCH model to the price data of Bitcoin has demonstrated promising results (Ardia *et al.* 2018). As such, the use of GARCH variants such as EGARCH and TGARCH, *i.e.* MRS-EGARCH and MRS-TGARCH, should also be considered within the MRS framework for modelling regime and variance heteroskedasticity of Bitcoin.

The fundamental tenet of finance is that risk (volatility) is compensated by return (price). As such, the pursuit of a considered price and accompanying robust risk management tools, necessitate an understanding of the volatility dynamics of financial instruments. Cryptocurrencies are being viewed more and more as a store of value and not just by a few feverish converts on cryptocurrency message boards. The presence of heterogeneous volatility regimes and asymmetric volatility jumps affirm that the use of single regime nonlinear models for capturing Bitcoin's volatility dynamics is ill-founded. It is recommended that any future research into modelling the volatility of Bitcoin, should indeed consider the nonlinear volatility characteristics discussed within this paper. The results contained within this paper will be useful to cryptocurrency stakeholders from an option pricing and risk management perspective.

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## Financial Performance of Healthcare Facilities in Slovak Republic

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### Abstract:

Measuring the performance of healthcare facilities is currently an actual topic. There is a large number of studies on this issue even nowadays, despite the fact that efficiency of hospitals and health care facilities has been under investigation for more than thirty years. Citizens of individual countries and governments invest a large amount of money in healthcare, either directly or indirectly, and as a counterpart they expect high-quality health services. The performance of this part of the public sector though is different from that of traditional business entities. The common goal of all functioning health systems in the world is to improve the health of the population in the country, regardless of the form of funding, ownership or way of organization. On the other hand, each healthcare system brings with it various problems, which are constantly being addressed in order to increase the efficiency of individual healthcare providers. Achieving optimal efficiency is key to both public and private healthcare facilities in order to improve the quality of healthcare provided and also to meet the needs of stakeholders. An efficient management system for healthcare facilities ensures high-quality outputs and eliminates resource waste. The aim of the contribution is to identify the financial situation in the health sector in Slovakia based on financial analysis and the use of cluster analysis.

**Keywords:** healthcare; financial performance; cluster analysis; Slovakia.

**JEL Classification:** L25; P17; H75.

### Introduction

Every year, the governments inform about increasing funds flowing to health care, but their rate of utilization face low efficiency. Measuring the financial performance of healthcare facilities could contribute to their better use and efficient allocation of available resources. First studies on the efficiency of hospitals and hospital facilities have

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emerged in the 1980s (Nunamaker 1983, Sherman 1984) and quantified effectiveness on the sample of American hospitals.

In the 1990s, the area of measuring hospital efficiency and identifying its determinants has become one of the key interests of health economists. Zere *et al.* (2006) conducted a study assessing 30 public hospitals and their results indicating technical efficiency at levels ranging from 62.7% to 74.3%. One of their proposals was the merging of hospitals located near to each other.

## 1. Literature review

Vincenzo and Dino (2007) examined effectiveness on a sample of 83 Italian hospitals (private and public). Their study showed that non-profit hospitals showed the lowest inefficiencies. They assessed that out of the total sample, 23 hospitals reported a drop in yields, 42 showed an increase in yields and 20 hospitals reported constant yields. They came to the conclusion, that private hospitals achieved the highest level of efficiency, as many other authors have confirmed.

Holmes *et al.* (2016) forecasts 8.01 % of rural hospitals to be at high risk of financial distress in 2015, 16.3 % as mid-high, 46.8 % as mid-low, and 28.9 % as low risk. The rate of closure for hospitals in the high-risk category is 4 times the rate in the mid-high category and 28 times that in the mid-low category. Their methodology offers improved specificity and predictive power relative to existing measures of financial distress applied to rural hospitals. This risk assessment tool may inform programs at the federal, state, and local levels that provide funding or support to rural hospitals.

According to Chen *et al.* (2017) healthcare services industry can be affected by many factors, of which economic downturn is a crucial one. As a result, it is worth investigating the condition and state of hospital management when economic downturn occurs.

Their paper aims to analyze how the great recession affects hospital performance in Pennsylvania during the period 2005–2012 by using data envelopment analysis (DEA). The analysis indicates that hospital performance slightly decreased due to the economic downturn in Pennsylvania. Hospital's management should have greater justification for incurring costs associated with bolstering patient experience programs. Improvements in training, technology, and staffing can be justified as a way to improve not only quality but now profitability as well. Authors used a sample of 19,792 observations from 3767 hospitals over the 6-year period 2007–2012. Using generalized estimating equations to account for repeated measures, we fit four separate models for three dependent variables: net patient revenue, net income, and operating margin. Authors identified that a positive patient experience is associated with increased profitability and a negative patient experience is even more strongly associated with decreased profitability (Richter, Muhlhestein 2017).

Governments in middle and low income countries have sought ways for the past decades to make their public hospitals more performing. Policies granting autonomy to public hospitals have had limited success. Decentralizing decision making to the operational level has had limited success. Stakeholders at the central level devise strategies to maintain their power. Two main obstacles are delegating authority over human resources and finances that are sine qua non conditions for governing and increasing the performance of public hospitals (Geyndt 2017). So far, we have shown foreign studies that describe the efficiency of hospital facilities, but there are not much similar Slovak or Czech studies. One of the authors, who have done similar study in the Czech Republic, was Dlouhy *et al.* (2007) who followed a sample of 22 hospitals.

Limitation of his study was that he did not consider any external impacts on the efficiency of hospital facilities. Studies in Slovakia have confirmed the increase in the technical efficiency of medical facilities, mainly the study by author Fris (2010), who stated that Slovakian hospitals were able to reduce input levels and increase output levels during the observed period. The drop of inputs was mainly due to a reduction in the number of nurses and beds, while the number of doctors remained unchanged. Efficiency increased to 84 % at constant economies of scale. Given the importance of the issue of the efficiency of healthcare facilities, we have decided to analyse the financial performance of healthcare facilities in Slovakia with selected financial indicators using cluster analysis.

## 2. Methodology

We have applied the cluster analysis procedure according to Stankovičová, Vojtková (2007). The cluster analysis application procedure will be as follows:

- Entering input data;
- Selecting the type of variables;
- Naming the objects;
- Selection of the agglomeration process;

- Selection of the type of aggregation method;
- Selection of the degree of similarity of objects;
- Determining the number of significant clusters;
- Interpretation of clusters.

We have realized selection of the degree of similarity of objects by applying a distance measure called Euclidean distance, formulated as follows:

$$d_{ij} = \sqrt{\sum_{k=1}^n (X_{ik} - X_{jk})^2} \quad (1)$$

where:  $X_{jk}$  is the value of the  $k^{\text{th}}$  variable for the  $i^{\text{th}}$  enterprise;  $X_{jk}$  is the value of the  $k^{\text{th}}$  variable for the  $j^{\text{th}}$  enterprise.

This distance assumes an orthogonal coordinate system, which means mutual non-correlation of variables. The disadvantages of this type of distance include the significant influence of the absolute value (amount) of input data. This disadvantage can be eliminated by using variables in their standardized shape (form) (Stankovičová, Vojtková 2007).

In terms of the type of aggregation (clustering) method, we have applied Ward's method (Ward's minimum variance method), which is the most used in practice. According to this method the clusters are formulated based on the maximization of homogeneity within the cluster. The homogeneity measure represents the sum of squares of deviations from the average of the cluster, called ESS (the error sum of squares) and we use the following formula for its calculation:

$$ESS = \sum_{i=1}^{n_h} \sum_{h=1}^q (X_{hi} - \bar{X}_{C_h})^2 \quad (2)$$

where:  $n_h$  is the number of objects in the cluster  $C_h$ ,  $\bar{X}_{C_h}$  is the vector of the averages of the values of the character in the cluster  $C_h$ ,  $X_{hi}$  is the vector of the values of the character of  $i^{\text{th}}$  object in the cluster  $C_h$ .

The cluster analysis is designed to create relatively homogeneous groups where it is necessary to determine an appropriate number of these groups based on various criteria, for example based on hierarchical tree – dendrogram (Stankovičová, Vojtková 2007). By performing the correlation of the input variables at the significance level of 5% ( $\alpha = 0.05$ ), we observe the dependence (relationship) between the variables. However, the problem may be a high degree of dependence (relationship) between variables, which can affect the classification results. This problem can be solved through the main components method, in which input indicators are transformed into the new variables called main components and they are already independent to each other. Only a few main components can reliably explain a substantial part of the overall spread of the original data. Therefore, several rules are used to determine the optimal number of components, for example:

- the number of main components should explain at least 80 % of the total spread of the data;
- for determination the number of main components to use a graphical representation of the spread explained by main components.

### 3. Results

Our analysis includes 952 healthcare companies, which are classified by number of employees, localization within regions, SK NACE classification, type of ownership and selected legal aspects of business (liquidation, restructuring). Table 1 below shows the number of businesses according to number of employees. Most companies employ from 5 to 9 employees (32.77%), the second most numerous group are companies with a number of employees of 3 to 4, which account for 24.78% of the total number of enterprises. Based on the database, we can say that the smallest share of employees is employed by enterprises employing 1,000-1,999 employees (0.003%) and 150-149 employees (0.005%).

Table 1. Research sample – enterprises by number of employees

Number of employees	Number of enterprises
unknown	8
1,000 – 1,999	3
500 – 999	16
250 – 499	13

Number of employees	Number of enterprises
200 – 249	12
150 – 199	5
100 – 149	14
50 – 99	31
25 – 49	57
20 – 24	20
10 – 19	148
5 – 9	312
3 – 4	236
2	59
1	17
0	1

Source: Finstat 2018, own processing.

When analyzing the sample of enterprises by region, we found that Bratislava Region has the highest share of enterprises, on the contrary, the lowest share is in Trenčín Region. Average distribution of healthcare enterprises in other regions reaches 11.54%.

Table 2. Research sample – distribution by regions

Slovak Regions	Number of enterprises	Distribution
Banskobystrický	106	11,13%
Bratislavský	209	21,95%
Košický	106	11,13%
Prešovský	119	12,50%
Nitriansky	112	11,76%
Trenčiansky	84	8,82%
Trnavský	95	9,98%
Žilinský	121	12,71%

Source: Finstat 2018, own processing

According to SK NACE (Nomenclature des Activités économiques dans les Communautés Européennes) the area of health service can be divided into the activities of short-term or long-term hospitals, general and specialized hospitals, surgical, psychiatric hospitals and hospitals for the abused persons, sanatoriums, preventers, medical nursing centres, mental asylum, rehabilitation centres, and other medical facilities that have accommodation facilities that provide diagnostics and provision of medical treatment for hospitalized patients with various health conditions. It also includes medical advice and general and specialist medical treatment by general practitioners and health specialists and surgeons and dental practice of general or specialized character and orthodontics. In addition, this classification covers also those health care activities not carried out by hospitals or practicing doctors but by senior medical staff legally recognized for the treatment of patients. Table 3 contains a classification of our sample of 952 enterprises per category.

Table 3. Research sample – distribution by SK NACE

Economic activity according to SK NACE	Quantity
Medical and dental practice activities [86200]	2
Hospital activities [86100]	35
Specialist medical practice activities [86220]	386
General medical practice activities [86210]	97
Other human health activities [86900]	197
Services of medical laboratories [86901]	32
Dental practice activities [86230]	203

Source: Finstat 2018, own processing

The most numerous group within our research sample is the Specialist medical practice activities (386 facilities) followed by Dental practice activities (203 facilities) and other human health activities (197 facilities). On the contrary, the least represented groups are Services of medical laboratories (32 facilities) and medical and dental practice activities (2 facilities). Table 4 contains characteristics of indebtedness within research sample.

The majority of enterprises (up to 90.33%) is of domestic – private ownership. In a significantly lower number are represented international – private, foreign and state facilities. The smallest share is represented by the ownership of association of natural or legal persons or church and ownership of a higher territorial unit.

Table 4. Selected characteristics of indebtedness

Selected characteristics of indebtedness		Quantity
Debts	Yes	39
	No	913
Bankruptcy and restructuring	Yes	2
	No	949
	Finished restructuring	1
Charging order	Yes	61
	No	891

Source: Finstat 2018, own processing

Table 5. Business division by ownership

Ownership type	Quantity
International – private	42
Domestic – private	860
State	13
Higher territorial unit	1
Foreign	52
Association of natural or legal persons or church	2

Source: Finstat 2018, own processing

Table 6 provides basic descriptive statistics (average, standard deviation, median, minimum and maximum) of selected financial indicators. These statistics can provide the qualitative and quantitative characteristics of the sample under review. Descriptive data statistics is required primarily to perform a relationship analysis using the Pearson correlation coefficient. In the research part of the contribution we will focus on the selected financial indicators ROE, Profit marge, Debt, Total debt, Assets or Equity from the financial statements of selected companies, namely equity, revenue, profit and value added.

Table 6. Basic descriptive statistics of selected financial indicators

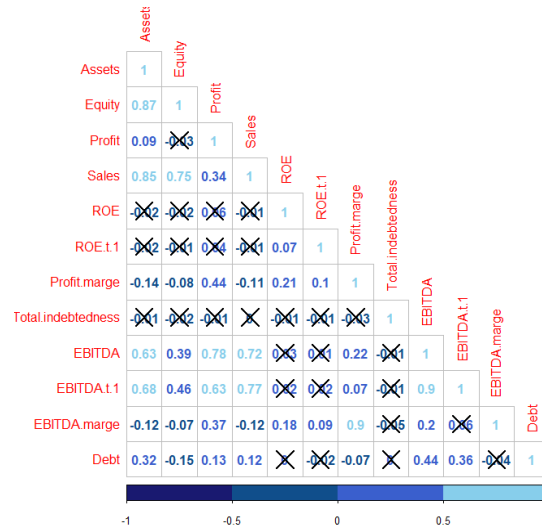
	Average in EUR	Standard deviation	Minimum	Maximum	Median
Assets	1.636.054,0	7.854.688,0	2.220,00	111.095.746	235.550
Equity	873.354,7	5.407.105,0	-3.072.997,00	98.132.165	112.099,5
Profit	80.794,0	496.180,6	-8.650.932,00	5.051.197	37.837,5
Sales	1.633.139,0	5.626.059,0	172.914,00	82.872.920	30.1240
ROE	30,57921	152,2767	-2185,620915	1.562,578753	28,98035494
ROE <sub>t-1</sub>	27,65778	179,2257	-3458,003953	1.480,30176	28,74189737
Profit marge	12,04557	19,44154	-280,417099	136,3559649	9,82403391
Total indebtedness	87,53709	1.005,678	-65,43367674	31.024,81982	45,99696675
EBITDA	205.067,2	785.169,3	-8.349.052,00	13.325.383	72.169,5
EBITDA <sub>t-1</sub>	203.014,2	683.441,2	-3.439.992,16	8.805.778	66.921
EBITA marge	22,1038	22,25048	-270,6317587	116,4939622	19,27574318
Debt	48.496,39	3.198.633,0	-30.032.898,00	81.180.879	-41.270

Source: own processing

In the next part of our contribution, we will focus on cluster analysis, which will allow to organize enterprises according to selected financial indicators into individual clusters that have similar characteristics and differ from those of other clusters. The method used for the clustering process was the Ward method, while the Euclidean distance was used to determine the degree of similarity of the objects under investigation. The statistical analysis was performed using the programming language R, which is suitable for the creation of statistical models and data analysis and is also suitable for graphic analysis of data. For cluster analysis, however, it is necessary to exclude statistically significant, but weaker dependencies, as they could distort the result of cluster analysis. The following figure shows that, for example, in the case of ROE, ROE<sub>t-1</sub> and Total indebtedness, all the coefficients are statistically insignificant.



Figure 1. Spearman's correlation coefficient analysis



Source: own processing using a statistical program

In the case of the EBITDA, Debt, and Profit, some of their correlations are statistically significant at the significance level of 0.05. This means, that there may be a problem with cluster formation in cluster analysis. Therefore, it is necessary to use the analysis of the main components, replacing the original variables with their standardized form. Consequently, it is necessary to determine, how many components will represent the original financial indicators. Based on the screen plot of the main components and the variability of the original data variance, we identified 7 major components that explain 96.81% of the variability of the original data variance.

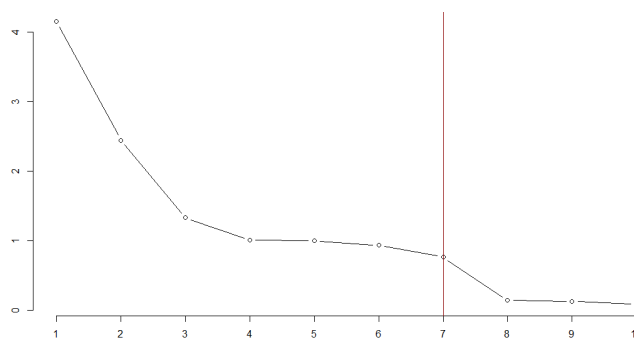
Table 7. Variability of seventh main component

Seventh component	Value
Standard deviation – 7 <sup>th</sup> component	0.8731718
Proportion of Variance – 7 <sup>th</sup> component	0.0635400
Cumulative Proportion – 7 <sup>th</sup> component	0.9681400

Source: own processing using a statistical program

In this case, we have fulfilled the condition that the selected number of components should explain at least 80% of the variability of the original data variance. In order to confirm the correct selection of components, we have also chosen the data visualization where on the x-axis the number of components and on the y-axis variances are situated.

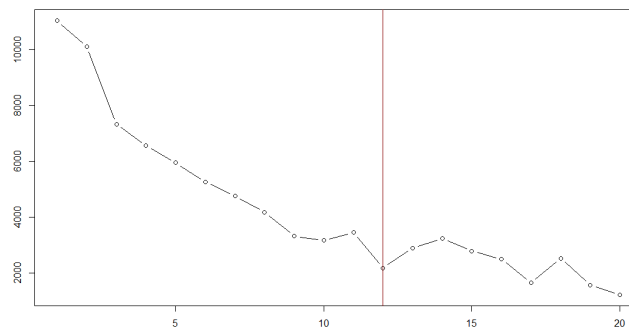
Figure 2. Screen plot of main components



Source: Own processing using a statistical program.

In the next step we have chosen the number of clusters of enterprises in our analysis. On the basis of the heuristic approach, we have divided the set of enterprises into 12 clusters. However, we also used the following Screen plot, where the number of clusters is displayed on the x-axis, and the y-axis displays sum of intra-clusters square. The decisive criterion is to minimize intra-cluster sum of squares.

Figure 3. Screen plot of number of clusters



Source: own processing using a statistical program

Consequently, we plotted our clusters in a hierarchical tree where all the clusters are marked. Each business is numbered. Twelve heterogeneous clusters have been created, but businesses within their cluster are homogeneous. Because of the large number of enterprises (952), the dendrogram itself is relatively unreadable and thus we present the aggregate data in the following table.

Table 8. Number of clusters

Cluster	1	2	3	4	5	6	7	8	9	10	11	12
Number of businesses	626	1	47	243	16	2	5	5	4	1	1	1

Source: Own processing using a statistical program R.

## Conclusion

The result of the analysis is the clustering of businesses within our sample. We can say that 12 clusters were formed, of which 4 clusters contain of one enterprise. The number of enterprises within each cluster was determined by selected financial indicators. Lone companies in clusters are the result of the extreme values of the financial indicators compared to other companies. The bulk of enterprises, however, is agglomerated. Clusters 1 and 4 are similar to their financial indicators. Clusters have also been created, ranging from 2 to 47 enterprises. The following table shows the centroids (averages) behind the clusters of companies - the average values of the financial indicators of the most numerous clusters.

Table 9. Cluster centroids (average values)

Group.1	Assets	Equity	Profit	Sales	ROE
1 1	584.116.1	199.145.0	24.262.40	964.028.8	26.661118
3 3	2.618.229.8	1.462.517.2	595.469.77	3.650.906.2	124.204043
4 4	344.706.9	217.682.9	96.700.06	304.072.9	53.969218
ROE.t.1	Profit marge	Total indebtedness	EBITDA	EBITDA t.1	
1 23.22473	4.874042	66.36917	76.649.48	71.662.41	
3 137.53149	20.434468	43.87000	949.393.34	889.157.43	
4 49.85140	31.877613	27.66247	140.821.13	119.642.01	
		EBITDA marge	Debt		
		1 12.89257	23.414.89		
		3 31.34468	-257.343.34		
		4 47.17922	-104.209.86		

Source: own processing using a statistical program R.

From the data above we can say that the most significant cluster has achieved the average value of the ROE indicator of 26.66% and in the previous period of 23.22%. Total debt of enterprises in cluster 2 reached -23,414.89 EUR. For a better reporting value, we use medians instead of centroid (s). The use of medians is due to the fact, that in the previous table the averages are possibility influenced by an extreme value of individual enterprises. For a median, this threat is eliminated as it is the value that divides the sequence according to the size of the sorted results into two equal halves.

Table 10. Cluster medians

Group.1	Assets	Equity	Profit	Sales	ROE	ROE.t.1
1 1	194,301.0	74,338	20,406.5	311,342.0	19.025	20.320
3 3	1,653,645.0	884,290	543,039.0	2,561,664.0	78.040	59.170
4 4	264,621.0	184,683	74,765.0	22,8448.0	43.350	41.700
Profit marge	Total indebtedness	EBITDA	EBITDA t.1	EBITDA marge		
1 5.275	56.415	47,554.0	41,540	13.405		
3 20.250	45.170	817,487.0	811,440	30.970		
4 28.440	20.750	111,398.0	99,620	44.870		
		Debt				
		1 -26937.0				
		3 175412.0				
		4 -85994.0				

Source: own processing using a statistical program R

In the most numerous cluster no. 2, we can see differences in almost all financial indicators in negative way compared to the average values. For example, for the ROE indicator, where the decrease of 7% to 19.025% has been observed.

Many indicators are used to measure and evaluate performance of healthcare systems – e.g. those created by the WHO, Eurostat, or OECD Health Statistics and OECD Health Policy Studies. (Hejduková 2016) According to Mihalčová (2017) measuring company performance by means of generally accepted indicators is a source to key information on company efficiency and its future prospects. This information provides various kinds of financial and non-financial indicators, the monitoring of which on the part of the company management is a clear sign of necessary changes or the opposite, that of maintaining the measures already established within the specific areas of the company, all that applicable to any branch of the national economy. Smatana (2016) analyzed of the Slovak health system reviews recent developments in organization and governance, health financing, health-care provision, health reforms and health system performance.

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## Profit Versus Financial Security for Small and Medium-Sized Enterprises in Poland

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### Abstract:

This study aims to verify the regression dependencies between profit on sales and enterprises own financial contribution, the EU operational fund, and the EU fund for supporting markets and capital in micro-, small- and medium-sized enterprises in Poland in 2014-2020. The study further aims to determine the marginal and average profitability of these financial funds, as they provide financial security to enterprises. This paper examines the regression dependencies between profit on sales and an enterprise's financial contribution (to EU funding), the EU operational fund, and the EU fund for supporting markets and capital in 2014-2020 (the Cobb-Douglas model). An aggregate increase of 10% in the last-mentioned independent variables will result in an increase in profit on sales of 4%. The above independent variables will ensure 40% financial security. Financial security among the examined micro-, small- and medium-sized enterprises in Poland will be relatively high in 2014-2020.

**Keywords:** financial security; EU funds; model; small and medium-sized enterprises.

**JEL Classification:** C14; D22; E51.

### Introduction

Corporate finance concerns financial phenomena and the processes that occur between them. These are connected with the selection of funding sources, their proportions, and their effective implementation in the enterprise. Corporate funding sources can be internal or external. In today's economic systems, finance is concentrated within the enterprise, but is affected by external factors. The nature and complexity of monetary relationships between economic and social processes vary.

GDP per capita is an objective criterion when allocating EU funds to regions (provinces). However, the amount of funds granted to a country depends on a number of other factors, and is therefore subject to negotiations with the European Commission. The highest growth in EU spending in Poland will be seen in innovation and support for enterprises, including micro-, small- and medium-sized ones. In a market economy, these enterprises are subject to the same rules of operation as other economic entities, and their decisions are based on economic calculations. In this way, they strive to achieve a certain level of profitability and financial security. Financial security provides the enterprise with adequate financial liquidity and solvency. Financial security therefore becomes increasingly important when competition is fierce, especially in small- and medium-sized enterprises. These enterprises perceive financial security as their main priority. This is because financial security and credibility are essential in the eyes of their stakeholders.

This study aims to verify the regression dependencies between profit on sales and enterprises own financial contribution, the EU operational fund, and the EU fund for supporting markets and capital in micro-, small- and medium-sized enterprises in Poland in 2014-2020. The study further aims to determine the marginal and average profitability of these financial funds, as they provide financial security to enterprises.

This research is predicated on the hypothesis that the EU fund for supporting markets and capital effectively contributes to an increase in the profitability of the enterprises own financial contribution to the EU funds.

The remainder of this essay is structured as follows: section 2 offers a concise review of the literature; section 3 explains the methodology of the research; section 4 presents the empirical data and its analysis; the effects of the research are shown in section 5; lastly, section 6 proposes initial conclusions

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## 1. Literature review

EU funding should help stabilize profit on sales when the market suddenly changes (Platt and Platt 2006). Access to EU funding is important in the case of very poor results, whatever the type of business entity (Hill 2012). By their nature, EU funds provide financial security without directly impacting the direction of commercial decisions. This is corroborated by the research of Goodwin and Mishra (2006). The category of financial security of an enterprise can be derived from the theory of finance and the theory of financial risk. Financial security can therefore be regarded as freedom from the influence of financial threats. "Financial threat" is a fluid and dynamic category that is difficult to quantify in clear terms (Mikoláš *et al.* 2019). This is confirmed by the results of empirical studies conducted by Platt and Platt (2006). Anglosphere economists point to the cash flow statement as an ongoing kind of financial security for an enterprise, having defined the financial security of an enterprise as the cash flows required to make debt repayments on time (Rujoub, Cook, Hay 1995) (Sharma, Iselin 2003), (Dahiya *et al.* 2003), (Tong and Serrasqueiro 2019).

The classification of business bankruptcy prediction models was developed by Altman (1968), Asquith *et al.* (1994), Lau (1987), and John *et al.* (1992). That profit, including operating profit and net profit, can assume negative values, is the basis of the classification applied by the last-mentioned authors. The model is essentially based on linear regression. However, empirical research seems to imply that it is impossible to exhaustively measure the linear input of investing, including that of financial funds.

Bain (1968) claims that external industrial forces affect the work of managers. Hence, alternative products, clients and suppliers, as well as potential and existing market participants, determine strategic choices. There are two major generic strategies, viz. to differentiate and reduce costs (Hudakova and Dvorsky 2018). Focusing on the operations and divisions of enterprises depends on factors that determine costs and make it possible to benefit from their differentiation (Hedman and Kalling 2003). Mosakowski and McKelvey (1997) and Chatterjee (1998) explain that a feature that improves the quality of a product or speeds up the provision of a service may be an indirect result (part of the measurement) that can represent either something between a resource and a product, or profitability. These authors suggest that there is a need to aggregate partial variables and aggregated variables including the following categories: clients and participants (industry); operations and organization (value chain); proposal (general strategy); and resources and products (market factors). Such a transparent setup of variables may help increase the explanation, and by extension, the value of the regression model.

Small businesses have proved to be very important for economic growth and job creation in recent years. At the same time, they are considerably diversified, so as to be able to secure the long-term external funding necessary to maintain growth and development. Research has confirmed that a subsidy (EU funds) guides the market in acquiring resources (Winborg and Landström 2001). The allocation of EU funds is therefore validated by the market. This is crucial in terms of the efficacy of their implementation and profitability. Small businesses often complain that they are unable to obtain credit during the biggest slowdowns. However, theory shows that a strong relationship with the bank can alleviate this problem. On the other hand, empirical research shows that a strong long-term relationship lowers the likelihood of having to provide collateral or personal guarantees. This is important for small businesses (Degryse and Van Cayseele 2000). It is also necessary to provide for certain or probable losses and expenses. These reserves help protect the enterprise's operations against the risk of bankruptcy (Pringle and Harris 1987).

The size of an enterprise is also a major factor, not only in terms of the availability of credit, but also in terms of the experience and costs of obtaining it (Ozkan 2000, 2002), (Scherr and Hulburt 2001). An enterprise is therefore an economic category which has the quality of a feature as a result of being evaluated by the market. This implies that small businesses have difficulties in gaining access to finance, and as a result, are left with the limited monochromatic choices of either self-financing (Chandler and Hanks 1998), investing the money of their owners (or their families) (Orser *et al.* 2006), (Roper and Scott 2009), (Verheul and Thurik 2001), or borrowing money short term. While this provides short-term financial security, it restricts the growth and development of small- and medium-sized enterprises in the long run (Hudakova *et al.* 2018). This results in small enterprises becoming more diversified, and implies a need for better market knowledge, as well as better relationships with customers and staff, as this allows markets to be penetrated and the capabilities of the enterprise to be expanded (Robinson and Dechant 1997).

## 2. Methodology. Method(s) of the analysis

Unfortunately, there are no clear-cut determinants that would enable the financial security level of an enterprise or region to be fully determined (Trenovski and Tashevskaja 2015). The determinants that can be used for this purpose are incidental to developmental factors. Profit on sales, which represents the surplus of sales revenue over costs,

is the most commonly used measure of an enterprise's economic development. The same value of profit on sales can be generated at different levels of resources employed (and with different relationships), and at different scales of economic activity. Hence, profit on sales was adopted as a dependent variable that is representative of micro-, small- and medium-sized enterprises in Poland in 2014. It is dependent on the conditions of sale and on costs – their level and their changeability in relation to sales. Profit is an internal source of development funding, and therefore has a significant impact on the value of the enterprise.

It can be assumed that the set of examined enterprises may have the character of the proportionality of the odds for growth (Brant 1990). However, proportional financial support does not ensure prospects for the continuation and expansion of the enterprises' operations. Econometric verification will involve examining the level and the change trends in profit on sales, and identifying the impact of the EU funds that underwrite the financial security of the enterprises' operations under market conditions in 2014-2020.

All the variables, and the funding (including the profit) in the model are (discrete) random variables, and represent a regression relationship. Furthermore, the variables are a finite group (they cover the entire Poland) and have the nature of empirical regression curves. These curves represent the dependence between the attributes, *i.e.* the manner in which the values of two attributes are related. This justifies the use of the Cobb-Douglas curvilinear power production function to identify the regression dependency between profit on sales and the enterprises own financial contribution, the EU operational fund, and the EU fund for supporting markets and capital in 2014-2020.

The economic and mathematical dependency between profit from sales as for 2014 (Y3) and the security funds determining the said figure, *i.e.* enterprises' own contribution between 2014 and 2020 (X1), the EU operational fund in 2014–2020 (X2) and the EU market and capital support fund in 2014–2020 have been employed. The mathematical model is used in the investigation of the regressive association between financial safety on the part of EU funding and the profit on sales in micro-, small-, and medium-sized enterprises in Poland. The model can also be used in simulation analyses.

The Cobb-Douglas power function is describable as follows:

Profit on sales = f (own capital/equity contribution, EU operational fund, EU market and capital support fund) (1)

The Cobb-Douglas function in a symbolic form:

$$Y3 = aX1^b X2^c X3^d e^* \quad \text{where: } [e^* - \text{estimation error}] \quad (2)$$

Profit on sales in effect-of-scale terms:

$$\mu = b + c + d \quad (3)$$

Contribution of own funds and EU funding in the profit on sales:

$$s_{a,b,c} = a(\text{or } b \text{ or } c \text{ or } d)/(a + b + c + d) \quad (4)$$

'Own' flexibility of the profit on sales:

$$O_{a \text{ or } b \text{ or } c \text{ or } d} = (a \text{ or } b \text{ or } c \text{ or } d - 1) \quad (5)$$

Average profitability of the use of own contribution ( $R_p$ ), operational fund (X1), and market (X2) and capital support fund is calculated as follows (X3):

$$R_p = \frac{Y3}{X1 \text{ or } X2 \text{ or } X3} \quad (6)$$

The formula for marginal profitability of own contribution (X1), operational fund (X2), and market and capital support fund (X3) is:

$$R_k = \frac{Y3}{X1 \text{ or } X2 \text{ or } X3} \times b \text{ or } c \text{ or } d \quad (7)$$

The above measures of economic effects have been used in the econometric analysis in question.

### 3. Data and empirical analysis

The study focused on empirical data collections from micro-, small- and medium-sized enterprises, *e.g.* the enterprises' own financial contribution and two EU funds in every province of Poland in 2014 (N = 16). When carrying out research on financial security using the Cobb-Douglas curvilinear power production function, it is important to define and adopt a dependent variable. Financial security of enterprises is sufficiently complex as to

require the consideration of a range of various determinants that cannot be fully controlled by a policy of supporting small- and medium-sized enterprises. When generating very poor production results, enterprises may receive support in the form of EU funds (Hill 2012). Direct and indirect forms of support create a complex system known as a financial security network. The financial security network comprises indirect payments, e.g. the EU operational fund, which is separate from, but related to, production decisions made in response to market needs. Direct payments under the EU operational fund should first of all ensure that profit on sales is stable in the event of sudden market developments, including natural disasters. By contrast, indirect financial security, guaranteed by the possibility of implementing the EU fund for supporting markets and capital, has an impact on market orientation.

The empirical variables for the Cobb-Douglas model were selected using the matrix of logarithm coefficients. The criteria for selecting variables for the model were a strong correlation between each independent variable and the dependent variable, and weak correlations between the independent variables. Numerical calculations were conducted using SPSS software.

The linear correlation (Pearson's correlation) between profit on sales and sales revenue in the examined enterprises is 0.867, or 0.819 once the number of enterprises is taken into account, and the significance of correlation coefficient is 0.00. Pearson's correlation coefficient ( $r$ ) in the finite group of analyzed empirical distributions determines the direction of dependence, which is characterized by a high degree of correlation between profit on sales ( $r = 1$ ) and the above variables. This explains the accurate selection of profit on sales as the dependent variable when analyzing (verifying) the performance of the two EU funds that constitute the financial security of the examined enterprises in Poland in 2014-2020. Moreover, Pearson's correlation coefficient ( $r$ ) of the dependent variable, profit on sales ( $Y_3$ ), and the independent variable of the enterprises' own financial contributions ( $X_1$ ) is 0.469, with the independent variable of the EU operational fund ( $X_2$ ) is 0.416, and with the independent variable of the EU fund for supporting markets and capital ( $X_3$ ) is 0.863, and the significance of correlation coefficient at 0.00. Pearson's correlation coefficient ( $r$ ) of the enterprises' own financial contribution ( $X_1$ ) and the EU operational fund ( $X_2$ ) is similar, as they perform the same role in the enterprises. Pearson's correlation coefficient ( $r$ ) between the independent variables  $X_1$  and  $X_2$  is 0.982, and between  $X_2$  and  $X_3$  is 0.757, and the significance of correlation coefficient is 0.001. These determinations of the strength of the linear correlations of these characteristics enable the parameters of the variable characteristics to be presented in Table 1.

Table 1. Parameters of variable characteristics in provinces and in micro-, small- and medium-sized enterprises (SMEs) in Poland in 2014 and 2014-2020

Specification	Unit of measurement	Symbol	Arithmetic mean	Range min.-max.	Variation coefficient %
Profit on sales in 2014	PLN million	Y3	77,959.5	50,218.6 - 267,224.3	67.86
Enterprises' own contributions in 2014 -2020	EUR million	X1	390.6	181.2 - 694.7	29.05
EU operational fund in 2014-2020	EUR million	X2	1,952.9	906.1 - 3,473.6	34.74
European fund for supporting markets and capital in 2014-2020	EUR million	X3	143.7	45.3 - 484.2	80.45

Source: Author's calculations

The data in Table 1 show that the range of profit on sales ( $Y_3$ ) varies considerably within provinces and enterprises. Comparing the internal variation between the variables reveals that profit on sales demonstrates indirect differentiation of the characteristic among the variables in the distribution. The lowest internal differentiation of the characteristic in the distribution appears in own financial contribution and in the EU operational funds in enterprises and provinces. The highest internal differentiation of the characteristic in the distribution appears in the European fund for supporting markets and capital in 2014-2020. This means that the values of the characteristic of the fund are more widely dispersed around the average. This shows that this variable will play the greatest role in shaping the financial security of the examined enterprises. As part of the EU operational fund, micro-, small- and medium-sized enterprises in the provinces will be able to receive support for investing in new machinery, increasing energy efficiency, renewable energy sources, information technologies, research and development, and scientific cooperation. These will be areas of support mainly connected with innovative production and products.

#### 4. Results and discussion

The curvilinear regression dependence of the variables is presented in tabular form in Table 2. The data in Table 2 present the regression dependence of profit on sales ( $Y_3$ ) of the enterprises on their own contribution ( $X_1$ ), the EU operational fund ( $X_2$ ), and the EU fund for supporting markets and capital ( $X_3$ ). These variables ( $X_1$ ,  $X_2$  and



X3) help determine the variability of profit on sales to within 90%. Profit on sales that determines the coefficient of determination ( $R^2$ ) above 0.9 indicates a very good explanation of the enterprises' financial security (Neumark, Tinsley and Tosini 1991). Furthermore, the higher the  $R^2$ , the better the fit to the empirical data and the higher the confidence in the regression model. The strength of the relationship expressed by the multiple correlation coefficient (R) between profit on sales and the enterprises' own contribution, the European operational fund and the European fund for supporting markets and capital, as given by the positive square root of  $R^2$ , is 94.87%. This correlation does not describe a causal relationship. Therefore, the regression dependences have been analyzed. The standard errors of the regression coefficients (parameters) are less than 50% of their absolute values. The absolute values of the t-test, however, are several times higher than the values of the regression coefficients, while the significance level of the regression coefficients remains in the range 0.00-0.05. These statistical evaluations of the regression coefficients (parameters) provide information about the possibility of using them in an econometric analysis of the variability of profit on sales in relation to the enterprises' own contribution and the financial security provided by the EU operational fund and the fund for supporting markets and capital in 2014-2020.

The regression coefficients and function parameters at X1, X2 and X3 describe the elasticity (elasticity coefficients) of profit on sales in relation to the enterprises' own financial contribution (X1), and the EU funds (X2 and X3) (of financial security). Solow (1956) explains that they are the elasticity of Y3 in relation to X1, X2 and X3, and according to the marginal theory of distribution expounded by Clark, J.B. they are the shares of the enterprises' own financial contributions (for obtaining EU funds) (X1), of the European funds (X2 and X3) in relation to the profit on sales of the analyzed enterprises.

Table 2. Power regression of profit on sales of micro-, small- and medium-sized enterprises (SMEs) on their financial contribution (X1), the EU operational fund (X2), and the EU fund for supporting markets and capital in 2014-2020.

a*	Regression coefficient			Standard error				Test t				R2
	X1	X2	X3	A	X1	X2	X3	a	X1	X2	X3	
179870.4	1.179	-1.513	0.732	0.95	0.58	0.55	0.09	12.8	1.7	-2.8	8.6	0.90

Note: a\* – delogarithmised absolute term. The significance level is within the range of 0.00-0.05.

Source: Author's calculations

The elasticity of profit on sales (Table 2) is highest in relation to the enterprises' own financial contribution (1.179). The growth it expresses is more than proportional and curvilinear. The elasticity of profit on sales in relation to the EU fund for supporting markets and capital is more than 1.6 times lower. The nature of that dependence is less than proportional and curvilinear. The elasticity of profit on sales in relation to the EU operational fund is negative (-1.513). This means that an increase of the profit on sale by 1% (with other financial funds unchanged) is related to a decrease in the implementation of the EU fund by 1.5%. The above elasticity coefficient expresses the relationship between a relative change in profit on sales and a relative change in the EU funds that cause that change. The changes in the relationship between the enterprises' own contribution and the EU operational fund mainly result in changes in the structure of profit on sales. The EU operational fund and the fund for supporting markets and capital can possibly trigger a lot of euros from the examined enterprises' own funds. These will be the multiplier effects of the investments from the EU funds. The highest multiplier effects are to be expected from those investments that lower the costs of production and the costs of services, that trigger the positive effects of profit on sales, and that activate the utilization of the production capacity of the enterprises. Decisions regarding the implementation of funds for supporting markets and capital will be influenced by the environment of the individual enterprises (Rostášová and Chrenková 2010).

The sum of the elasticity coefficients (powers) in 2014-2020 (Table 2) is less than one (0.398). As a result, profit on sales relative to the combined impact of private financial contribution (X1) and EU funds (X2 and X3), increases less than proportionally at the relatively constant level of other financial assets. A total increase of 10% in the EU funds will result in an increase in profit on sales of 4%.

Attempting to describe financial phenomena and processes in terms of cause and effect, and searching for regression relationships and dependencies among them, are important elements of finance theory. It is therefore necessary to determine the corresponding level of profit on sales in 2014 in the range of variability of the companies' own financial contribution, the EU operational fund and the EU fund for supporting markets and capital in 2014-2020. This was used to determine the marginal and average profitability of the independent variables in micro-, small- and medium-sized enterprises in Poland. The marginal and average profitability of the enterprises' own financial contributions (to EU funds) is presented in Table 3.

Table 3. The marginal and average profitability of the enterprises' own financial contribution (to EU funds) in the examined enterprises in 2014-2020.

Profit on sales (Y3) in PLN million	Own contribution of enterprises (X1), EUR million	Profitability:	
		average PLN/ EUR	marginal PLN/ EUR
45,434.13	238.0	190.90	225.07
58,521.86	295.0	198.38	233.89
72,072.87	352.0	204.75	241.40
86,024.03	409.0	210.33	247.98
100,328.66	466.0	215.30	253.84
114,950.66	523.0	219.79	259.13
129,861.26	580.0	223.90	263.98
145,036.86	637.0	227.69	268.44

Source: own calculations based on the data in Tables 1 and 2.

The average and marginal profitability (Tables 3, 4 and 5) in relation to each other is proportional through the constant elasticity of profit on sales in relation to the enterprises' own financial contribution, the EU operational fund and the EU fund for supporting markets and capital in the examined enterprises.

When the enterprises' own contribution (to EU funds) (X1) increase, marginal profitability (Table 3) increases faster than average profitability. Under these conditions, the overall profitability of the enterprise's own contribution will increase more rapidly. This proves that the EU operational fund will contribute significantly to the growth in the profitability of the financial assets of the analyzed enterprises. The above dependencies hold in an environment of irrational management. This indicates that the future growth and expansion of the examined enterprises will be very dynamic in 2014-2020.

Table 4. Marginal and average profitability of the EU operational fund in 2014-2020

Profit on sales (Y3) in PLN million	EU operational fund (X2) in EUR million	Profitability:	
		average PLN/ EUR	marginal PLN/ EUR
172,112.24	1,191.37	144.47	-218.58
124,382.09	1,476.64	84.23	-127.44
95,213.16	1,761.91	54.04	-81.76
75,873.70	2,047.18	37.06	-56.08
62,283.11	2,332.45	26.70	-40.40
52,306.13	2,617.72	19.98	-30.23
44,728.58	2,902.99	15.41	-23.31
38,814.46	3,188.26	12.17	-18.42

Source: Own calculations based on the data in Tables 1 and 2.

When the operational fund (X2) increases, marginal profitability (Table 4) equals zero and there is a resulting decrease in average profitability. The latter relationship shows that global profitability will reach its maximum. This in turn shows that the rational management environment of the operational fund will come to an end in the analyzed enterprises in 2014-2020.

Table 5. Marginal profitability and average profitability of the EU fund for supporting markets and capital in 2014-2020.

Profit on sales (Y3) in PLN million	EU fund for supporting markets and capital (X3), in EUR million	Profitability:	
		average PLN/ EUR	marginal PLN/ EUR
59,755.80	94.07	635.23	464.99
81,122.56	142.83	567.97	415.75
100,583.64	191.60	524.97	384.28
118,749.40	240.38	494.01	361.61
135,942.74	289.15	470.15	344.15
152,372.16	337.92	450.91	330.07
168,175.80	386.69	434.91	318.35
183,452.64	435.46	421.28	308.38

Source: Own calculations based on the data in Tables 1 and 2.

When the EU fund for supporting markets and capital (Table 5) increases, marginal profitability decreases. This results in a decrease in the average profitability of that fund, albeit at a slower pace. Overall profitability on supporting markets and capital will increase as a result of these relationships, although its rate of growth will reach

its maximum. That is why implementing the fund for supporting markets and capital is rational and comes under the umbrella of rational management. Here, the elasticity of profit on sales in relation to the fund for supporting markets and capital is greater than zero but less than one ( $0 < E_v < 1.0$ ). Consequently, increasing the fund for supporting markets and capital results in increasingly higher marginal growth of that fund's profitability in the examined enterprises.

Profitability is the sum total of the financial results generated in various aspects of the enterprise's operations. The level of profitability and its rate of growth are determined by the profitability of all the different kinds of operations of the enterprise and their shares in the structure of aggregate profitability. This measure is independent from the profit taxation rate. The average growth rate within the ranges of the individual variables has been presented in Table 6.

Table 6. Average growth rate in the range of variability: profit on sales (Y3), own contribution (X1), financial funds (X2 and X3), and the average and marginal financial security of enterprises, %.

Specification	% of Table 3	% of Table 4	% of Table 5
Profit on sale (Y3)	18.04	-19.17	17.38
Increase in the own contribution of enterprises (X1)	15.10		
Increase in the financial operational fund (X2)		15.10	
Increase in the financial fund for supporting markets and capital (X3)			24.47
Profitability:			
- average	2.55	-29.77	-5.70
- marginal	2.55	-29.77	-5.70

Source: data from Tables 3, 4 and 5. Calculations made using dynamics based on variable and geometric mean

The data in Table 6 show that the average growth rate in profit on sales (18%) will be ensured by the average growth rate of the enterprises' own financial contributions (to EU funds) (15%). The average growth rate of the marginal and average profitability of the enterprises' own contribution remains stable and unchanging (2.5%). These circumstances indicate that an own contribution has a more than proportional impact on the relative growth of profit on sales. By contrast, if the average growth rate of the EU operational fund and the enterprises' own financial contributions are the same, the average growth rate of profit on sales will decrease (-19%). This will be caused by the negative growth rates of marginal and average profitability (-30%). Marginal profitability will determine the negative growth rate of profit on sales. It needs to be added that the operational fund will be related to the enterprises' own contribution by a complementary and substitutional relationship. The enterprises' own contribution will likewise be operational in nature, and will thus shape the production processes and product characteristics. The high growth rate of the financial fund for supporting markets and capital (24.5%) will be the most desirable one. This fund will help maintain the growth rate of profit on sales (17%) and safeguard the level of operating profitability (X1 and X2) in enterprises. A negative growth rate in marginal and average profitability (-5.7%) may indicate that the level of the financial fund for supporting markets and capital will be too low to significantly insure the profitability of operating activity in the examined enterprises in 2014-2020.

## Conclusions

The empirical research conducted here confirms the hypothesis that the EU fund for supporting markets and capital effectively contributes to an increase in the impact of the enterprises' own financial contribution on their profit on sales. This is demonstrated by the fact that the growth rate of profit on sales from own financial contribution and the fund on supporting markets and capital approximated each other (18%). A total increase of 10% in the enterprises' own financial contributions, the operational fund and the fund for supporting markets and capital EU funds will result in an increase in profit on sales of 4%, while the enterprises' other funds remain relatively constant. The financial security of enterprises brought about by the enterprises' own financial contribution, the operational fund and the fund for supporting markets and capital will be 40% guaranteed. This is a relatively high level of financial security for the examined enterprises. It also needs to be added that profit on sales is itself a financial fund that offers the examined enterprises real financial security and growth. Research show that the EU operational fund will contribute significantly to the increase in the profitability of the enterprises' own contributions. This indicates that future growth and development will be very dynamic in the examined enterprises in 2014-2020. Implementing the fund for supporting markets and capital is rational and within the sphere of rational management. Moreover, increasing the fund for supporting markets and capital will result in much higher marginal growth of that fund's profitability in the examined enterprises. The average growth rate of profit on sales (18%) will be ensured by the average growth rate of the enterprises' own financial contributions (15%), which is in a substitutional relationship

with the EU operational fund, and the rapid growth rate of the financial fund for supporting markets and capital (24.5%). The latter growth rate explains that the level of the fund for market support may be too low, but will ensure an average growth rate of profit on sales similar to that from the enterprises' own contribution (more than 17%).

Assessed based on empirical data, the Cobb-Douglas model enriches the theory of the financial security of enterprises and makes a new contribution to economic science (model = theory). It may also be of use in the forecasting/prediction of increase in profit on sales upon implementation of enterprises' own contribution, the operational financial fund and the marked-and-capital-support fund, as well as their profitability, up to 2020. The limitations to the research boiled down to the need to use the profit from sales of 2014; this was due to the retarded publication of the Statistical Yearbook for the provinces of Poland: Central Statistical Office [GUS] has delayed it by more than 12 months (the reason being the method employed to verify the statistical data received from the regions). Whilst such a delay is normal and regular as far as the yearly sequences are concerned, the empirical data prove to be reliable – and enjoy considerable trust in the EU statistics. In future, the author will do research on the financial security of enterprises within the regions of Poland, assuming different dependent variables as effects of the development of enterprises. The research into financial security within enterprises forms a practical directive for a change in the economic system, as well as economic and financial policy.

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## Comparing Generation Z's Behavior Intention in Using Digital Wallet for Online and In-store Transaction: A Unified Theory of Acceptance and Use of Technology 2 Approach

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### Abstract:

Generation Z is the future generation of our society and has the most interaction with technology. Their behavior intentions in utilizing technology have an important role in today's most prominence financial technology, particularly related to digital wallet companies. The present research explored different factors affecting Generation Z's behavior intention of digital wallet and its two different usages: online transaction and in-store transaction. Extended Unified Theory of Acceptance and Use of Technology (UTAUT2) were applied to explore factors related to digital wallet use. One hundred sixty-five respondents from Generation Z were involved in this research. Fourteen hypotheses were proposed and eight of them were accepted. For online transaction, social influence, performance expectancy, habit, and price value were found as significant factors affecting behavior intention. For in-store transaction, performance expectancy, hedonic motivation, habit, and price value were found as significant factors affecting behavior intention. Digital wallet companies need to focus on these significant factors in order to enhance their services.

**Keywords:** generation Z; digital wallet; online transaction; in-store transaction; UTAUT 2; behavior intention.

**JEL Classification:** M31; M10; M13; M15.

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## Introduction

The digital revolution is transforming our way of life to this day. Almost every fulfillment of needs, whether it is goods or services, could be facilitated by utilizing the digital platform especially the internet (Wargin and Dobiéy 2001). Massive growth of the use of e-commerce is an example of the utilization in digital platform (Bogue 2016, Cohen and Kietzmann 2014). Aside from that, the dynamic structure of markets and the business competition factor forces companies to innovate and to maintain their competitiveness (Prasetyo *et al.* 2014). This maintaining process requires a new kind of ways and methods that can make it easier for customers, which in turn gives them convenience (Dereli 2015). Fortunately, the presence of payment services using an electronic system, which popularized by e-commerce, could answer this problem (Ming-Yen *et al.* 2013).

Digital wallets are one of the most popular payment services which use electronic systems. Digital wallets are perceived to give customers more convenience because of the lack of needing to use cash or credit cards. Digital wallet itself is defined as the use of smartphone functioning as a leather wallet, having capabilities to store receipts, coupons, business cards, bills, and mainly making payments (Bagla *et al.* 2018). Customers can buy many kinds of products from plane tickets to groceries using a digital wallet (Chandra 2017). There is also an almost nonexistent security threat for digital wallets (Upadhayaya 2012).

One of the reasons for the extensive use of digital wallets is the growth of online shopping (Wiese and Humbani 2019). This growth is possible because online shopping or e-commerce requires a comfortable, secure, and free payment method for its different kinds of transactions. Digital wallets can provide these benefits (Heiskanen 2016). More than 70% of consumers use credit and debit card to enjoy a comfortable and efficient payment experience (Chakraborty *et al.* 2016). Digital wallets emerged as a payment alternative other than credit and debit cards to give significant increases in payment efficiency and ease for consumers, even more so than what credit and debit card already does (Upadhayaya 2012).

The use of Digital wallets is not limited to an online transaction only; digital wallets could also be used to do transactions with offline merchants who have already registered as a partner of the digital wallet (s) used by the shopper. One of the examples for this is the use of Paytm, an Indian digital wallet with more than 30.000 merchants as partners, to do cashless transactions (Chauhan and Shingari 2017). There is also Alipay, a Chinese based digital wallet, which provides in-store transaction by using QR codes to complete a transaction with a merchant (Lu 2018). This in-store transaction can make consumers understand better information related to the products they are looking, better opinions collections and sharing, and enabling consumers to use in-store promotions available in the store (De Kerviler *et al.* 2016).

The differences in both model of digital wallet transaction: online and in-store, should also create different acceptance by consumers and in turn different marketing decision making. There are some researches addressing digital wallets done by academics, especially on the subject of digital wallet's acceptance and behavioral intentions. Even so, this research is limited only to the acceptance and behavioral intention of digital wallet's usage for online transactions (Uddin and Akhi 2014, Chandra 2017). A further investigation particularly related to different factors affecting behavior intention of using digital wallet is required.

The purpose of this study is to explore different factors affecting Generation Z's behavior intention of digital wallet and its two different usages: online transaction and in-store transaction. Generation Z is seen as the generation that is competent in using technologies; it is possible because since they were born, interacting with the internet and its many usages is a normal thing for them (Persada *et al.* 2019). This intense interaction of Generation Z with technologies made Generation Z as the generation who has the most exposure of digital transaction (Priporas *et al.* 2017). With the addition of these considerations regarding Generation Z, the final output of the present research would be the understanding on how Generation Z perceived (acceptance and intention to future usage) digital wallets on two different usage methods. The results of this study could be very beneficial for companies to understand more their Generation Z's consumers and in turns creates a better marketing strategy; differentiating the two methods of payment using digital wallet: online and in-store.

## 1. Literature review

### 1.1. Digital Wallet

#### Online transaction

The presence of electronic payment for online transaction is getting more and more visible in e-commerce platforms. Digital wallet became one of most prominence transaction method in which users can choose from. Digital wallet is the 2<sup>nd</sup> most used payment methods among six other alternatives. An online transaction using digital wallet is seen to have the advantage of convenience, effectivity, and security (Uddin *et al.* 2014). Digital wallet is also known

for its modern advantages such as personalization and instant connectivity (Osakwe and Okeke 2016 ). Digital wallet has already proven its dominance by having a high presence in many means of trade activity involving internet connection such as ride service, food delivery, even for paying monthly bills (Rosnidah *et al.* 2019).

#### *In-store transaction*

Transactions using digital wallet are not limited to online means; digital wallets could also function as a cash alternative in which customers pay for goods or services to merchants in a non-online situation. The main factor of why customers use a digital wallet for the in-store transaction is the time-saving aspect of a digital wallet, especially on Point of Sale (POS) related transaction such as parking fee, train, and movie tickets (Gao *et al.* 2009). Not only the buyer, merchant who is accepting digital wallet as a payment method is gaining many benefits; from the faster transaction process, more efficient cash management, to cheaper labor cost (Mallat and Tuunainen 2008, Hayashi and Bradford 2014). This type of transaction, commonly referred to as in-store transaction, usually works by making customers scan some Quick Response (QR) code with their mobile devices in order to confirm payment (Lu 2018). Different in-store transaction method is also done by using Near Field Communications; placing NFC-supported device near a payment terminal (Taylor 2016).

#### 1.2. Generation Z

Generation Z is the generation which born in the time of internet commercialization, they are born after the year 1995 (Persada *et al.* 2019). This generation interacted directly with the use of the internet and the digital era. Generation Z differs from the previous generation seen from their addiction to technology, individualistic attitude, and convenience-oriented attitude. Generation Z sees technology not as some innovation but rather as a 'thing' that existed in their daily life since they are born (Berkup 2014). Generation Z, which born after the Millennials, are thriving on technology (Shatto and Erwin 2016). Interestingly, they can be seen as conservatives; responsible an individual and conforms to traditional values ( Rehman 2017).

#### 1.3. UTAUT 2

The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) is a more developed technology acceptance model compared to the first one. It was developed by the same person that created the first UTAUT, Venkatesh; he added new variables such as hedonic motivation, price value, and habit into the original construct (Venkatesh and Davis 2000). UTAUT2 is seen as the most comprehensive model because it integrates different technology acceptance model. The new variable of Hedonic Motivation (HM), Price/Value (PV), and Habit (H) are the main difference between UTAUT2 and UTAUT. This three new variable is modeled to have a direct correlation with Use Behavior (USE) and Behavioral Intention (BI) (Arenas *et al.* 2015). UTAUT2 has been successfully used to test hypotheses in topics related to the adoption of mobile payment and banking (Oliveira *et al.* 2017). Thus, using UTAUT2 to investigate the topic in the present research is deemed appropriate. The present research will not use demographics as moderators in order to get a more general view of Generation Z's behavior, the focus in understanding behavior intention will also diminish the need to include Use Behavior. The variables use in this research is explained in greater detail in the following section:

##### 1) Performance Expectancy (PE)

PE is seen as an important variable used in both UTAUT and UTAUT2 to measure how far the use of a product or technology gives benefits to customer (Venkatesh *et al.* 2003). This definition is built on the argument of when a customer experiences more productivity, the motivation to accept and use a particular technology will also increase (Alalwan *et al.* 2017). Previous researches also succeeded in proving that PE has a positive effect on the intention of using digital wallets (Megadewandanu 2016). Thus, this study first hypothesis is:

*H1: Performance expectancy has a significant effect on the behavioral intention to use a digital wallet for in-store/online transaction*

##### 2) Effort Expectancy (EE)

Effort Expectancy represents the easiness of particular technology usage (Venkatesh *et al.* 2003). For individuals to accept new technology, effortlessness is a factor very important to consider (Davis 1989). Thus, our second hypothesis is:

*H2: Effort Expectancy has a significant effect on the use of digital wallet for in-store/online transaction*

##### 3) Social Influence (SI)



Social Influence is a factor involving the perception of individual to how important people around him/her think about the use of a particular technology (Venkatesh *et al.* 2003) (Yuan *et al.* 2015). This is important to understand the social aspect of technology use and acceptance, which brings us to our third hypothesis:

*H3: Social Influence has a significant effect on the behavioral intention to use a digital wallet for in-store/online transaction*

#### 4) Facilitating Condition (FC)

Facilitating Condition is how an individual perceived the supporting infrastructure and technology for a particular technology (Venkatesh *et al.* 2003). The individual will use and enjoy a new technology when the technology is supported by the surrounding facility (Sivathanu 2019). Our fourth hypothesis is:

*H4: Facilitating Condition has a significant effect on the behavioral intention to use a digital wallet for in-store/online transaction*

#### 5) Hedonic Motivation (HM)

Hedonic Motivation is the feeling of satisfaction an individual experience in using a particular technology (Venkatesh *et al.* 2003). Past research has already proved that empirically, HM has a significant effect on individual behavioral intention (Megadewandanu 2016, Slade *et al.* 2015). This study's fifth hypothesis is:

*H5: Hedonic Motivation has a significant effect on the behavioral intention to use a digital wallet for in-store/online transaction*

#### 6) Price Value (PV)

Price Value is the monetary aspect of new technology adoption; it determines whether or not a particular technology is economically appropriate for adoption by an individual (Baptista and Oliveira 2016). PV is our sixth hypothesis:

*H6: Price Value has a significant effect on the behavioral intention to use a digital wallet for in-store/online transaction*

#### 7) Habit

Habit is the perception build by an individual after using a particular technology, transforming into something that an Individual automatically do in the future continuously (Baptista and Oliveira 2016). This research considers habit as an important factor to see customer pattern in using a digital wallet; the hypothesis is as follows:

*H7: Habit has a significant effect on the behavioral intention to use a digital wallet for in-store/online transaction.*

## 2. Methodology

This study utilized Confirmatory Factor Analysis (CFA) to derive the model correlation of UTAUT2 framework. Using CFA allows us to understand the Generation Z Behavioral Intention (BI) towards Digital Wallet' use for the online/in-store transaction. This study focuses on seven independent variables which previously mentioned: PE, EE, SI, FC, HM, PV, HB and one dependent variable: BI (Baptista and Oliveira 2016). In order to acquire the required data, we use a survey employing Likert scale ranging from 1 to 5 (1 representing strongly disagree and 5 strongly agree) (Khan *et al.* 2017). The survey was conducted by online means, made possible by Google Forms, an effective and reliable online questionnaire deployment service (Megadewandanu 2016, Prasetyo *et al.* 2014, Van Selm and Jankowski 2006). The questionnaire is divided into two main sections: first being demographics-related questions and the second being model-related questions. The model-related questions consisted of 52 question items with the function of projecting the 8 variables used for this study. The list of question is presented in the Table1.

Table 1. List of question and variables projected

Variable	Online Question	Variable	In-store Question
PE1	Digital wallet is useful tools for my online transaction	PE1	Digital wallet is useful tools for my in-store transaction
PE2	Digital wallet enables me to finish various type of online transaction easily	PE2	Digital wallet enables me to finish various type in-store transaction easily
PE3	Using Digital wallet increases my productivity in online transaction	PE3	Using Digital wallet increases my productivity in in-store transaction
EE1	it would be easy for me to understand online transaction mechanism of Digital wallet apps	EE1	it would be easy for me to understand in-store transaction mechanism of Digital wallet apps

Variable	Online Question	Variable	In-store Question
EE2	I find Digital Wallet for online transaction through apps is convenient for me	EE2	I find Digital Wallet for in-store transaction through apps is convenient for me
EE3	I find Digital wallet in online transaction easy to use	EE3	I find Digital wallet in in-store transaction easy to use
EE4	It is easy for me to become skillful at Digital wallet for online transaction	EE4	It is easy for me to become skillful at Digital wallet for in-store transaction
SI1	People who are important to me think that I should use Digital wallet for online transaction	SI1	People who are important to me think that I should use Digital wallet for in-store transaction
SI2	People who influence my behavior think that I should use a digital wallet for online transaction	SI2	People who influence my behavior think that I should use a digital wallet for in-store transaction
SI3	People whose opinions I value prefer that I use Digital wallet for online transaction	SI3	People whose opinions I value prefer that I use Digital wallet for in-store transaction
FC1	I have the resources necessary to use Digital wallet for online transaction	FC1	I have the resources necessary to use Digital wallet for in-store transaction
FC2	I have the knowledge necessary to use Digital wallet for online transaction	FC2	I have the knowledge necessary to use Digital wallet for in-store transaction
FC3	Digital wallet for online transaction is compatible with other technologies I use	FC3	Digital wallet for in-store transaction is compatible with other technologies I use
FC4	I can get help from others when I have difficulties using Digital wallet for online transaction	FC4	I can get help from others when I have difficulties using Digital wallet for in-store transaction
HM1	Using digital wallet for online transaction is fun	HM1	Using digital wallet for in-store transaction is fun
HM2	Using digital wallet for online transaction is enjoyable	HM2	Using digital wallet for in-store transaction is enjoyable
HM3	Using Digital wallet for online transaction is very entertaining	HM3	Using Digital wallet for in-store transaction is very entertaining
H1	The use of digital wallet for online transaction has become a habit for me	H1	The use of digital wallet for in-store transaction has become a habit for me
H2	I am addicted to using Digital wallet for online transaction	H2	I am addicted to using Digital wallet for in-store transaction
H3	I must use Digital wallet for online transaction	H3	I must use Digital wallet for in-store transaction
PV1	The best of my knowledge, there are no digital wallet charges for online transaction	PV1	The best of my knowledge, there are no digital wallet charges for in-store transaction
PV2	At the current price, Digital wallet for online transaction provides a good value	PV2	At the current price, Digital wallet for in-store transaction provides a good value
PV3	I have never given up purchasing on Digital wallet for online transaction	PV3	I have never given up purchasing on Digital wallet for in-store transaction
BI1	I intend to continue using a digital wallet for online transaction in the future	BI1	I intend to continue using a digital wallet for in-store transaction in the future
BI2	I will always try to use Digital wallet for online transaction in my daily life	BI2	I will always try to use Digital wallet for in-store transaction in my daily life
BI3	I plan to continue to use Digital wallet for online transaction frequently	BI3	I plan to continue to use Digital wallet for in-store transaction frequently

Source: Own preparation.

Following some previous studies (Lee *et al.* 2019, Tak and Panwar 2017), we applied purposive sampling as our sampling technique; a form of non-probabilistic sampling, using only respondents who were in the Generation Z age range. For the measurement and modeling purposes, we utilized IBM SPSS 23 and IBM SPSS AMOS 20. The IBM SPSS 23 was utilized to conduct descriptive statistics analysis (Lin *et al.* 2019, Lin and Prasetyo 2019), and the IBM SPSS AMOS 20 was utilized to conduct the Structural Equation Modeling (SEM). AMOS is commonly known as a reliable software to do CFA and SEM. Before testing our seven hypotheses, some reliability and convergent validity test were tested: Composite Reliability, and Average Variance Extracted tests, each uses the minimum standard of 0.7 and 0.5 (Nadlifatin *et al.* 2016, Lin *et al.* 2017, Chin and Lin 2016). The second test was conducted to justify our model structure: Model Fit Test, we employ Goodness of Fit Index and Comparative Fit Index, both with the minimum value required of 0.90 (Lin *et al.* 2018, Megadewandanu 2016).

### 3. Results and discussion

#### 3.1 Descriptive statistics

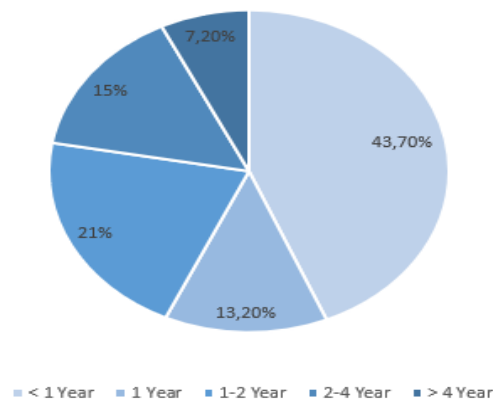
Our research questionnaire was distributed from April to May of 2019. A total of 165 respondents from 30 different cities in Indonesia were collected with the proportion of 38,9% male respondents, 65,5% female respondents, and 0,6% prefer not to answer their gender. The respondents were spread across 32 different universities and 3 different high schools. Our respondents were born after the year 1995, appropriate with the definition of Generation Z. We also asked our respondent regarding their digital wallet's use experience; 43,7% of our respondents had the experience of using digital wallet for less than a year, 13,2% of our respondents had the experience of using digital wallet for a year, 21% of our respondents had the experience of using digital wallet for 1-2 years, 15% of our respondents had the experience of using digital wallet for 2-4 years, and only 7,2% of our respondent uses digital wallet for more than 4 years. Other information that we acquired was their preferred digital wallet product, OVO, Go-Pay, and i-Saku placed in the top three most used digital wallet product for our respondent. Our demographic is also shown in Table 2 and Figure 1.

Table 2. Respondent gender and range of age

Respondent Demographics	Categories	In %
Gender	Male	38,9%
	Female	60,5%
	Other	0,6%
Range of Age	<20 years old	23%
	20-24 years old	77%

Source: Own preparation.

Figure 1. Respondent's digital wallet usage experience



Source: Own preparation

#### 3.2. Data analysis

This study utilized SEM to test the proposed hypotheses. An important step in SEM is to test the reliability of the construct for the hypotheses first. We used Factor Loadings, Composite Reliability, and Average Variance Extracted. Factor loading is needed to measure the correlation between a questionnaire item to its latent construct; higher Factor Loading' value means a higher contribution of a questionnaire item to its latent construct (Cheng 2001). Composite Reliability is the square of factor loading total value for a construct divided by the factor loading total value for a construct and added with the total error value (Tan 2001). Average Variance Extracted represents the average variance or discrepancy of the manifest variable (questionnaire item) from a latent construct. The higher the manifest variable's AVE value, the better the representation it has to the latent construct (Wold 1975). We see appropriate values for the reliability and convergent validity test items; surpassing the minimum value set previously, Table 3 and 4 show the result of the reliability test and convergent validity of our observed variables.

For our online transaction and in-store questionnaire, PE as the first factor had three observed parameters: PE1, PE2, and PE3. EE also had three parameters for the online transaction: EE1, EE2, and EE3, while the in-store transaction had four observed parameters. Both in-store and online transaction had three observed parameters for SI, FC, HM, H, and BI. The online transaction had only two PV observed parameters: PV1 and PV2, while in-store had three: PV1, PV2, PV3.

Table 3. Questionnaire reliability and convergent validity measurement result in online transaction

Factor	Item	Factor Loadings (>0,7) <sup>a</sup> (Hair <i>et al.</i> 2012), (Lin, Wu and Tsai 2005)	Composite Reliability (>0,6) <sup>a</sup> (Bacon, Sauer and Young 1995)	AVE (>0,5) <sup>a</sup> (Macedo 2017, Palau- Saumell <i>et al.</i> 2019)
PE	PE1	0,9	0,7	0,6
	PE2	0,7		
	PE3	0,6		
EE	EE1	0,8	0,7	0,6
	EE2	0,7		
	EE3	0,8		
SI	SI1	0,7	0,7	0,6
	SI2	0,9		
	SI3	0,8		
FC	FC1	0,8	0,7	0,5
	FC2	0,8		
	FC3	0,6		
HM	HM1	0,9	0,7	0,8
	HM2	0,9		
	HM3	0,8		
H	H1	0,8	0,7	0,7
	H2	0,9		
	H3	0,8		
PV	PV1	0,5	0,6	0,5
	PV2	0,9		
BI	BI1	0,7	0,7	0,6
	BI2	0,8		
	BI3	0,8		

Table 4. Questionnaire reliability and convergent validity measurement result in in-store transaction

Factor	Item	Factor Loadings (>0,7) (Hair <i>et al.</i> 2012), (Lin, Wu and Tsai 2005)	Composite Reliability (>0,6) <sup>a</sup> (Bacon, Sauer and Young 1995)	AVE(>0,5) <sup>a</sup> (Macedo 2017, Palau- Saumell <i>et al.</i> 2019)
PE	PE1	0,8	0,7	0,7
	PE2	0,8		
	PE3	0,8		
EE	EE1	0,9	0,8	0,8
	EE2	0,9		
	EE3	0,8		
	EE4	0,9		
SI	SI1	0,9	0,7	0,7
	SI2	0,9		
	SI3	0,9		
FC	FC1	0,9	0,7	0,7
	FC2	0,8		
	FC3	0,8		
HM	HM1	0,9	0,7	0,7
	HM2	0,8		
	HM3	0,8		
H	H1	0,8	0,7	0,7
	H2	0,9		
	H3	0,9		
PV	PV1	0,6	0,7	0,7
	PV2	0,6		
	PV3	0,8		
BI	BI1	0,7	0,7	0,7
	BI2	0,8		
	BI3	0,8		

Source: Own preparation

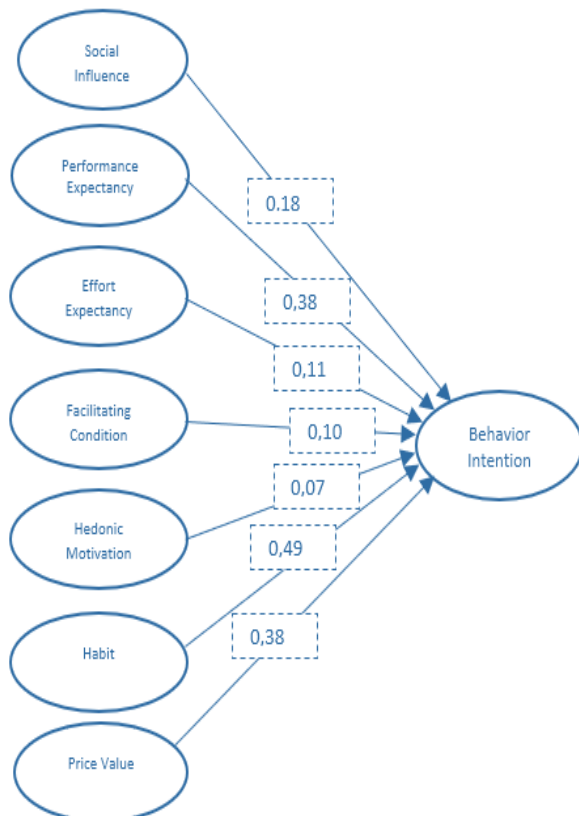
For online transaction model, the lowest factor loading value was 0.5 for the observed variable PV1; indicating that this variable had a low strength in projecting PV dimension. For the observed variables of PE3 and FC3, factor loading value was 0,6 or moderately acceptable. The rest of factor loading values were higher or equals to 0.7, an adequate number in determining construct representativeness. Composite Reliability showed all value to be higher than 0.7. The Average Variance Extracted also showed fair values, all surpass the minimum value of 0.5. These values justified our survey instrument reliability and convergent validity.

For in-store transaction model, the lowest factor loadings were 0.6 for PV1 and PV2, indicating that the factor loadings for the in-store transaction questionnaire were moderately acceptable. All The Composite Reliability values were above 0.6, indicating each construct was consistent. The Average Variance Extracted also surpassed the minimum value of 0.5. Table 3 and Table 4 shows that our research instrument is satisfactory.

For SEM analysis, we validated our model by using Model Fit analysis; confirming the structural model fitness, we utilized CFI and GFI. We utilized CFI as the first indicator because this index is relatively insensitive to the amount of sample and less influenced by the model structural complexity. The CFI result extracted from IBM SPSS AMOS 20 showed the CFI value of 0.748 for online transaction questionnaire and 0.750 for in-store transaction questionnaire, these values were moderately acceptable for CFI standard (Ahmad 2005, Norberg *et al.* 2007). GFI as the second index was utilized as a model fit test for its ability to project the model fitness from the residual square of the predicted model compared with the actual data. The result for the GFI test shown to be moderately acceptable, with the value of 0.643 for online transaction questionnaire and 0.6 for the in-store questionnaire (Ahmad 2005)

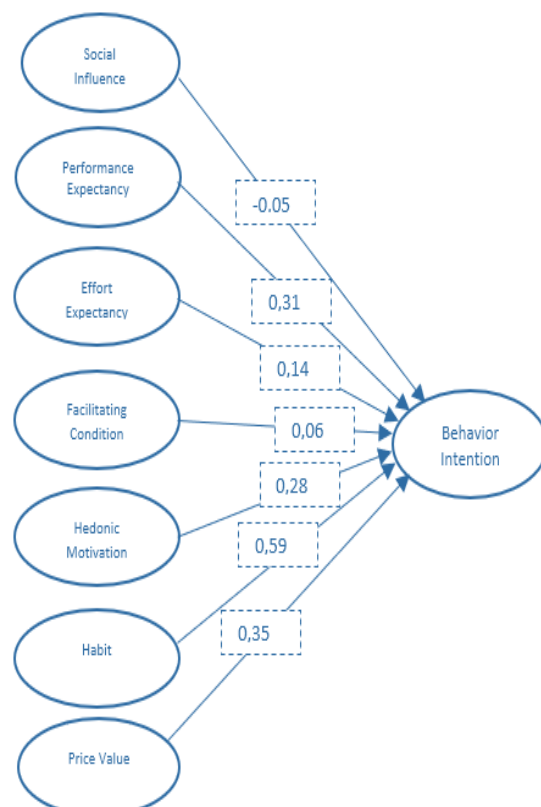
After the data and the model were considered appropriate, hypotheses tests were the final part of this section; examining whether our proposed hypotheses were accepted or rejected. The SEM result for digital wallet's use for online transaction shows that every UTAUT2 construct had a positive relationship with Behavioral Intention. Habit (H) shows the highest value (0.49) compared to other construct and Hedonic Motivation (HM) showed the lowest value (0.07). The rest of the constructs' values are shown in Figure 2.

Figure 2. Model result for online transaction



Source: Own preparation.

Figure 3. Model result for in-store transaction



Source: Own preparation.

The last SEM result for the in-store transaction, shows one (PE) hypothesis, which had a negative relationship with Behavioral Intention. Habit (H) showed the highest value (0.59) compared to other constructs, and Hedonic Motivation (HM) showed the lowest value (-0.05). Hypothesis models are shown in Figure 3, above.

Table 5 shows the direct relationship between the constructed model. In the online transaction, four hypotheses were accepted: SI → BI; PE → BI; H → BI; PV → BI, leaving only EE, FC, and HM to be rejected. The rejection of these hypotheses indicated that Effort Expectancy, Facilitating Condition, and Hedonic Motivation had not significant positive relationship and the practical implication is Generation Z does not see the easiness on using a digital wallet, supporting facilities, and the enjoyment in using digital wallet as a significant factor for their decision making.

The in-store transaction also had four accepted hypotheses: PE → BI; HM → BI; H → BI; PV → BI, leaving only SI, EE, and FC to be rejected. Data from this study showed the total BI described by UTAUT2 model for digital wallet' use for online transaction was 59.3% and for the in-store transaction was 67.7%, indicating that the models used were capable for understanding Generation Z Behavioral Intention for Digital Wallet' use.

Table 5. Significance of the correlation results

Correlation between Factors	P<0,01(Online)	P <0,01(In-store)	Hypothesis (Online)	Hypothesis (In-store)
SI → BI	0,086	0,670	Supported	Not supported
PE → BI	0,001	0,013	Supported	Supported
EE → BI	0,303	0,187	Not supported	Not supported
FC → BI	0,451	0,575	Not supported	Not supported
HM → BI	0,518	0,047	Not supported	Supported
H → BI	0,001	0,001	Supported	Supported
PV → BI	0,001	0,050	Supported	Supported

Source: Own preparation.

One limitation of this study is the sample size, the commonly recommended sample size is 200 (Wolf *et al.* 2013) and this study only presents 165 samples even though this number is also acceptable after considering the model fit tests (Mamra *et al.* 2017, Persada, Miraja and Nadlifatin 2019).

## Conclusion

This study explored the Behavioral Intention of digital wallet' use for the online and in-store transaction. We utilized the UTAUT2 model, including all seven constructs to derive Generation Z's Behavioral Intention. We collected 165 data from Generation Z respondents and conducted a Confirmatory Factor Analysis. From the total of 14 hypotheses for both digital wallet use (online/in-store), eight were accepted. The accepted hypotheses such as the positive significant effect of SI, PE, H, PV to BI (PE, H, PV being the most influential factors) for online transaction means managers should consider the habitual aspect of digital wallet usage, making Generation Z consumers use a digital wallet as much as possible for them to have the future intention to use a digital wallet.

Digital wallet companies also need to consider greatly the value proposition given to their Generation Z consumers because Generation Z values PE and PV, the value-adding aspect of digital wallet products greatly. For the in-store transaction, Generation Z has less consideration on Social Influence, Effort Expectancy, and Facilitating Condition. Social Influence is especially unique for the in-store transaction; Generation Z considers more on the social aspect for online transaction; managers do not need to worry Generation Z social aspect for the in-store transaction. Some of the strongest positive correlations, on the other hand, were Performance Expectancy and Habit for the in-store transaction; managers need to put emphasis on these variables in order to increase Generation Z' in-store transaction. The results of this study could be very beneficial for companies to understand more their Generation Z's consumers and in turns creates a better marketing strategy of digital wallet.

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## The Impact of Corporate Social Responsibility Disclosures on Profitability and Effective Tax Rate on 2013 to 2017

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### Abstract:

This study aims to examine the impact of corporate social responsibility (CSR) on profitability and effective tax rates of banking companies listed on the IDX by means of statistical tests of panel data regression, processed using STATA 12.0 application. This study employs secondary data with documentation techniques and content analysis. The samples taken in this study consists of 10 banking companies listed on the Indonesia Stock Exchange (IDX) from 2013 to 2017. The independent variable in this study is CSR Index which will be calculated using GRI-G4 guideline, while dependent variables in this study are profitability and effective tax rate (ETR). This study also employs control variables, namely, company size, capital adequacy ratio, loans to deposits ratio, non-performing loan, leverage, and capital intensity. The results of the study show that CSR disclosure did not have significant impact both on profitability and effective tax rate.

**Keywords:** corporate social responsibility; disclosure; profitability; effective tax rate; banking sector.

**JEL Classification:** A13; A20; A30.

### Introduction

Tax revenue in Indonesia reported in Government Revenue Realization 2013-2017 ranged from 74-84% (bps.go.id, 2018). This percentage illustrates how the government relies on tax revenues as funding sources for national economy. The government, as tax collector, and taxpayer have different interests in perceiving imposition of tax. The government wants to keep optimizing government revenues from taxes to finance state administration, while taxpayers try to pay taxes to a minimum. This is because taxes will certainly reduce the income or profits of taxpayers. Taxpayers will try to pay tax as minimum as possible so that income or profit that has been targeted can be achieved. It is possible for taxpayers to pay minimum taxes if there is an opportunity to abuse loopholes in tax regulations.

The existence of these different interests drives taxpayers to make efforts to reduce their tax payments legally or illegally. Companies use effective tax rates (ETR) as one of the references in implementing company's tax system policies (Ardyansyah and Zulaikha 2014, Saragih 2017). Effective tax rate can be used as an effective

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measurement for tax planning. Therefore, legal tax avoidance is usually proxied by ETR. According to Karayan and Swenson in Ardyansyah and Zulaikha (2014), one of the many ways to measure how well a company manages its tax is by checking the percentage of its effective tax rate.

Currently, CSR becomes debate among business people. Corporate social responsibility (CSR) means that a company must be responsible for every of their action that has an impact on society, community, and environment. Therefore, negative impacts of business activities that harm society and the environment must be acknowledged and disclosed in company reports. For companies that implement CSR, the government provides compensations or incentives in accordance with the costs incurred for CSR activities. In Indonesia, tax incentives provided by the Director General of Taxes to taxpayers, who are also business people, are in the form of tax deductions, where the amount of cost spent on CSR is allowed as deduction for computing taxable income of the company, so that it can affect the company's effective tax rate.

To implement CSR, companies certainly do not incur small amount of additional costs, but these additional costs show the company's commitment in implementing social responsibility. According to Kamaludin (2010), additional costs incurred by companies for social responsibility do not cause negative exchanges and will contribute to good corporate performance. CSR activities that are carried out continuously in the long run will actually help the company in reducing various costs, such as promotion and advertising costs, etc., so that CSR activities can help companies reduce costs and increase company profitability (Kamaludin 2010).

Banking industry is an industry that often receives awards for its CSR activities. It shows that CSR is not only implemented by industrial companies that cause negative environmental and social impacts, but also by other sectors, such as services, insurance, communications, bank financial institutions, non-bank financial institutions, and so on. The banking sector is expected to not only carry out the main tasks of the banking sector, but also to remain concerned about the environment.

In banking, the most important commodity is trust, so it is necessary for banks to maintain good relations with the community, which is customers and prospective customers (Barclift 2012). The 2008 financial crisis drew attention to the urgency for banking sector to implement CSR in order to increase trust as well as accountability and transparency (Lentner, Szgedi, Tatay 2015). If public feels that a bank benefits them, they will be willing to do transactions with the bank. Therefore, in terms of profitability, it is necessary for banking companies to set aside some profits for CSR financing in order to maintain public trust which is expected to increase corporate profits.

For community who experiences direct impact of CSR, CSR will certainly give companies a good image. However, for broader community, the information regarding CSR activities needs to be informed so that CSR activities are known, and thus giving the company good image. According to the Financial Services Authority, there have been no standards regarding reporting specifications that must be carried out by companies related to their CSR activities (Wareza 2018). The reference for CSR report information that is currently referred to is the Sustainability Reporting Guidelines (SRG), issued by the Global Reporting Initiative (GRI). In the SRG, there are 91 items in over 7 (seven) performance indicators. With this SRG, the disclosure of CSR information on the company's annual report is measured through scoring. From the explanation above, research questions can be formulated as follows:

- Does the disclosure of Corporate Social Responsibility (CSR) affect company's profitability?
- Does the disclosure of Corporate Social Responsibility (CSR) affect company's effective tax rate?

## 1. Literature review

### Corporate social responsibility (CSR)

Corporate Social Responsibility (CSR), according to the Organization for Economic Cooperation and Development (OECD) (2000), is business contribution to sustainable development. Corporate behavior must not only ensure return for shareholders, wages for employees, and products and services for consumers, but also respond to social and environmental problems. Because CSR is closely related to sustainable development, in carrying out its activities, company must not make decisions solely based on the decision's impact on business aspect, but also based on the decision's impact on society and environment (Wisanggeni and Suharli 2017).

In principle of responsibility, a significant emphasis is placed on the interests of stakeholders. Companies are required to pay attention to the interests of stakeholders, create added values from products and services to stakeholders, and maintain the continuity of these added values. Stakeholders can be defined as parties that have interest in the existence of the company. Corporate social responsibility is said to be a discretionary, which in a broad sense means something that needs to be done. If it is not done, it will result in self-harm (Efendi *et al.* 2011).

Carrol (1979) in Kartini (2013) has grouped the scope of corporate social responsibility into four groups, namely, economic responsibility, legal responsibility, ethical responsibility, discretionary responsibility. Meanwhile,

the Global Reporting Initiative (GRI) (2002) has developed a framework that can be divided into economic, social, and environmental performance. Social dimensions of sustainability that lead to the need for CSR implementation include various impacts caused by organizational activities on society, including employees, consumers, local communities, suppliers, and business partners. CSR activities, in this case, include four contexts, namely the work environment (occupational health and safety, wages and benefits, non-discrimination, child labor, etc.), human rights, suppliers, services and products.

Global Reporting Initiative (GRI) provides globally relevant framework to support standardized approach to reporting, which encourages the level of transparency and consistency in order to make the information useful and reliable for the market and society. The features in GRI make this guidance easier to use by companies from various sectors (globalreporting.org). Ideally, the sustainability report has a focus on issues that are relevant and on material in the context of economic and social sustainability, corporate environment, and surrounding stakeholders (Pusaka 2017).

### Company profitability

Profitability can be measured using profitability ratio that will show how effective a company works to generate profits. Profitability ratio is the net final results of various policies and decisions made by companies, in which this ratio is used to measure the company's ability to profit. So, profitability ratio is ratio that shows the combined effect of liquidity, asset management, and debt on the results of the company's activities.

The profitability ratio used in this research is Return on Assets (ROA) ratio, which shows the ability of company's management to generate income by managing their assets. This ratio shows the effectiveness of a company in utilizing their assets. The higher this ratio is, the more effective the use of these assets gets. ROA can be calculated by dividing net income by the total assets of the company.

### Tax planning and tax management

Zain (2003), has broadly stated that tax planning is a process of organizing taxpayers' businesses or group of taxpayers in such a way so that their tax debt, whether it is income tax debt or other tax debts, is in the most minimum level, as long as the process does not violate the provisions of tax laws and other provisions commercially. Furthermore, Zain also concluded that tax planning is an act to reduce tax burden legally, not an act to reduce the ability to fulfill tax obligations.

The definition of tax management has a broader scope than tax planning. Santoso and Rahayu (2013) defined tax management as a comprehensive effort carried out continuously by taxpayers so that all matters relating to taxation can be managed properly, economically, effectively, and efficiently, and consequently can make a maximum contribution to business continuity without sacrificing contribution to government revenues.

### Effective tax rate

Effective Tax Rate (ETR) plays a role in establishing tax provisions for companies. ETR has been used in previous studies to evaluate the fairness and efficiency of a taxation system. Fairness in the taxation system is often measured by comparing relative tax burden using average tax rate, which can be defined as the ratio of tax paid to income. According to Lanis and Richardson (2012), the lower ETR value of a company is, the higher the level of tax aggressiveness gets.

Hanlon and Heitzman (2010) used Effective Tax Rate (ETR) to measure the probability of companies to do tax avoidance, which is part of tax management, in order to separate current tax burden with pre-tax profit. With current tax burden, it is possible to select policies related to taxation and accounting. This study used Current ETR which is calculated by dividing the current income tax by pre-tax income.

### The relation between corporate social responsibility disclosure and profitability

The cost incurred for CSR can be calculated as company costs, as long as this cost comes from operational funds of company. Usually, reserve funds for CSR come from profits. Therefore, it can be said that CSR affects the profitability of the company. Some previous studies revealed that disclosure of CSR costs has a positive impact on the profitability of a company.

Wibowo (2012) also stated that CSR has a positive impact on company's profitability. In the marketing point of view, CSR will enhance company's image so that it will increase sales. CSR is related to company activities in order to show concern for the environment and society. By implementing CSR, companies can meet the demands of stakeholders, which in this case are environment and society, so that it will enhance the good image of the company. In line with this statement, the research of Angelia and Suryaningsih (2015) also concluded that

environmental performance and CSR disclosure have a significant impact on company's profitability, which was proxied by ROA and ROE.

### [The relation between Corporate Social Responsibility disclosure and effective tax rate](#)

Companies carry out CSR disclosures to gain positive legitimacy from the community in order to sustain the company. Companies are required to be able to carry out their activities in accordance with the values and limitations of social norms. The relation between CSR disclosure and effective tax rate lies in company's main goal to obtain maximum profit without eliminating social and environmental responsibility. So the greater the profit the company gets, the greater the taxable income is.

Jones, Baker and Lay (2016), in their study, concluded that CSR disclosure has a significant positive impact on company's effective tax rate. Contrary to the research of Jones, Baker, and Lay, Widhaningrum (2013) shows the results that CSR disclosure has a significant negative effect on ETR. Whereas, Susanti (2017) shows that CSR disclosure tends to have no effect on ETR.

## **2. Methodology**

### [Data type and data sources](#)

The type of data used in this study was secondary data. Secondary data used for dependent variables, independent variables, and control variables were obtained from annual reports and financial statements that have been audited and published by companies listed on the Indonesia Stock Exchange. To collect data, this study employed documentation techniques and content analysis.

### [Population, samples, and data](#)

The population in this study was banking companies in Indonesia that have published sustainability reports that refer to GRI-G4. Sampling was done using purposive sampling method, in which samples are determined based on purpose or consideration that is adjusted for the objectives of the study (Neuman 2006).

### [Dependent variable](#)

Dependent variable is a variable that is bound and influenced by other variables. The dependent variable used in Model I of this study was profitability which is proxied by ROA, and in Model II, the dependent variable was effective tax rate (ETR).

### [Independent variables](#)

Independent variable used in this study was Corporate Social Responsibility (CSR) Index. The CSR disclosure index was calculated by dividing total net income of the company by 91 indicators based on GRI-G4 (global reporting.com 2014). To determine the disclosure index of each sample of company, the first step is to give a score for each item from the list of disclosures. A score of 1 (one) is given if the item is disclosed, and a score of 0 (zero) is given if the item is not disclosed. Furthermore, the disclosure index is measured by dividing total score ration given to a company by the maximum total score that a company can obtain.

### [Control variables](#)

Control variable is a variable that is controlled or set constant so that the relation between independent variable and dependent variable is not influenced by external factors that are not examined. Based on previous studies, the variables used as control variables in Model I of this study were company size (SIZE), Capital Adequacy Ratio (CAR), Loans to Deposits Ratio (LDR), and Non Performing Loans (NPL). Whereas in Model II, the control variables were company size (SIZE), Leverage (LEV), Return on Assets (ROA), and Capital Intensity (CAPINT).

### [Data processing method and hypothesis testing](#)

Data processing methods employed four analysis methods, namely descriptive statistics, correlation analysis, and panel data regression analysis. Descriptive statistic is a statistic used to analyze data by describing data that have been collected as it is without intending to generalize. Correlation analysis is a link analysis method that tries to connect each element to create new forms that are different from previous forms. This study used panel data analysis as data processing method to test hypothesis. Panel data is combination of time series data and cross-section data. Combining information from time-series and cross-sections can overcome the problem of variable removal (Gujarati 2004).

## Development of research hypotheses

This study aims to describe the impact of CSR disclosure on profitability and effective tax rate of banking companies listed on the Indonesia Stock Exchange. Researchers used models with predetermined variables that have an influence on the profitability and effective tax rate of companies based on previous studies. Based on these models, hypotheses are formulated as follows:

- H1: CSRI has a significant impact on company profitability which is proxied by ROA;
- H2: CSRI has a significant impact on the company's effective tax rate (ETR).

## Regression equation model

In this study, hypotheses were tested using panel data analysis with Pooled Least Square which tests the impact of CSR cost disclosure on profitability and effective tax rate with control variables. The regression model used is as follows:

$$OA_{it} = \beta_0 + \beta_1 CSRI_{it} + \beta_2 SIZE_{it} + \beta_3 CAR_{it} + \beta_4 LDR_{it} + \beta_5 NPL_{it} + \varepsilon \quad (1)$$

$$ETR_{it} = \beta_0 + \beta_1 CSRI_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 ROA_{it} + \beta_5 CAPINT_{it} + \varepsilon \quad (2)$$

where: ROA: Return on Assets, LDR: Loans to Deposits Ratio; ETR: Effective Tax Rate; NPL: Non-Performing Loan; CSRI: Corporate Social Responsibility Index; LEV: Leverage Ratio; SIZE: Firm's Size; CAPINT: Capital Intensity; CAR: Capital Adequacy Ratio.

## Statistical testing

Statistical tests performed were the F-test (Multiple Linear Regression), coefficient of determination (R-squared) test, and T-test (Regression Coefficient Test). The F test is a test that is used to determine whether all independent variables simultaneously have an impact on the dependent variable significantly or not. Coefficient of determination (R<sup>2</sup>) test was done to find out how independent variable can explain dependent variable in the equation/model that will be studied. The T test was done in order to know the significance and to find out how significant the impact independent variables have on dependent variables.

## 3. Research results

### 3.1. Descriptive statistics

According to Sugiyono (2014), descriptive statistics is a statistic used to analyze data by describing data that have been collected as it is without intending to generalize.

Table 1. Descriptive statistics of variable research

Variable	Obs	Mean	Std.Dev	Minimum	Maximum
ROA	50	0.0225	0.0156	(0.0490)	0.0503
ETR	50	0.2347	0.0410	0.1582	0.3847
CSRI	50	0.2622	0.1228	0.1215	0.6542
SIZE	50	33.3403	0.7538	32.2111	34.6577
CAR	50	0.1796	0.0265	0.1281	0.2324
LDR	50	0.9518	0.3565	0.0000	2.6400
NPL	50	0.0131	0.0076	0.0020	0.0304
LEC	50	0.8294	0.5362	0.0724	2.3809
CAPINT	50	0.0157	0.0082	0.0061	0.0409

Source: Data Processed by Using STATA

The mean value of ROA was 0.0225 or equal to 2.25%. The highest ROA value in the sample companies was 0.0503 or equal to 5.03% and the lowest value of ROA was negative, namely -0.0490 or -4.90%. The standard deviation of the ROA variable was 0.0156 or 1.56%. The mean value of ETR was 0.2347 or equal to 23.47%. This result showed that the average effective tax rate of the sample companies WAS 23.47%. It can be seen that the average effective tax rate of sample companies was lower than 1.53%, compared to targeted tax rate which should be 25%. The highest ETR value of the sample companies was 0.3847 or equal to 38.47%, meaning that it is around 13.47% higher than the applicable tax rate. Meanwhile, the lowest value of ETR was 0.1582 or equal to 15.82%, which means it is lower than 9.18%.

The mean value of CSRI was 0.2622 or 26.22%. This result showed that averagely, sample companies have CSRI of 26.22%. The highest CSRI value in the sample companies was 0.6542 or equal to 65.42% and the lowest value of CSRI was 0.1215 or equal to 12.15%. The mean value of SIZE was 33.3403. This result shows that averagely, sample companies have company size of 33.3403. The highest SIZE value in the sample companies was 34.6577 and the lowest SIZE value was 32.2111.

The mean value of CAR was 0.1796 or equal to 17.96%. This result showed that the average capital adequacy ratio of the sample companies was 17.96%. The highest CAR value in the sample companies was 0.2324 or equal to 23.24% and the lowest CAR value was 0.1281 or 12.81%. This result showed that all sample companies have an average CAR value that has exceeded the safe limit (a minimum of 8%). The mean value of LDR was 0.9518 or equal to 95.18%. This result showed that the average capital adequacy ratio of the sample companies was 95.18%, and was still in the range in accordance with Bank Indonesia regulations (80% -100%).

The mean value of NPL was 0.1313 or 1.31%. This result showed that average non-performing loans ratio of the sample companies was 1.31%. The highest NPL value in the sample companies was 0.0304 or 3.04% and the lowest NPL value was 0.0020 or 0.20%. The mean value of LEV was 0.8294 or 82.94%. This result showed that the average non-performing loans ratio of the sample companies was 82.94%. The highest LEV value in sample companies was relatively high, which was 2.3809 or 238.09% and the lowest value of LEV was 0.0724 or 7.24%. Research result by Lanis and Richardson (2015) has revealed that companies with high leverage are thought to use interest expenses to reduce company's tax burden.

The mean value of CAPINT was 0.0157 or 1.57%. This result showed that averagely, capital intensity of the sample companies was 1.58%. The highest CAPINT value among sample companies was 0.0409 or equal to 4.09% and the lowest value of CAPINT was relatively very low because it was almost zero, which was 0.0061 or 0.61%.

### 3.2. Regression results in research Model I

Panel data regression in Model I can be explained in detail in Table 2 below.

#### Model I:

$$ROA_{it} = \beta_0 + \beta_1 CSRI_{it} + \beta_2 SIZE_{it} + \beta_3 CAR_{it} + \beta_4 LDR_{it} + \beta_5 NPL_{it} + \varepsilon \quad (3)$$

Table 2. Results of regression of research Model I

Variable	Coef.	Prob.
Constanta (C)	-0,2648	(0,001)*
CSR Index (CSRI)	0,0075	(0,576)
Ukuran Perusahaan (SIZE)	0,0086	(0,000)*
Capital Adequacy Ratio (CAR)	0,0974	(0,099)
Loans to Deposits Ratio (LDR)	-0,0163	(0,191)
Non Performing Loan (NPL)	-0,3012	(0,067)

Note: N = 50; Ajd R<sup>2</sup> = 0,5762; Prob. = 0.0000\*; \*significant at 5% level

Source: Data Processed by Using STATA

The table above shows that regression coefficient C was -0.2648 with a significance level of p-value 0.001 < 0.05 ( $\alpha = 5\%$ ). In particular, the model employed can be used to see the impact of all variables with ROA. The probability of F-Statistic value showed the number 0.0000 or 0%, so the value was lower than the significance ( $\alpha = 5\%$ ). The regression model can be considered to be accepted if Prob-value (F-statistic) is less than the significance ( $\alpha = 5\%$ ). It means that all variables simultaneously have been proved to have an impact on profitability (which is proxied by ROA).

The regression test results also showed that all variables, namely CSRI, SIZE, CAR, LDR, and NPL, simultaneously had significance level (R-Squared) of 0.5762 or 57.62% on ROA. Based on these results, CSRI variable and all control variables were able to explain variations in the ROA variable of 57.62%, while the remaining 42.38% might be explained by other variables or in other words, there were other factors of 42.38% which might also affect profitability of companies.

Based on the results in Model I, of all the variables, only SIZE variable had significant impact on ROA. This can be seen from the significance level of SIZE on ROA which was equal to p-value 0.0001 < 0.05 ( $\alpha = 5\%$ ), which meant that partially, SIZE variable had a significant impact on the dependent variable, ROA. SIZE had positive value of coefficient in regression of 0.0086, so the bigger the size of a company (SIZE) is, the higher the level of



profitability gets. According to Chen, Hung, and Wang (2017), the larger the size of the company is, the larger the scale of production of the company becomes, and the ability to reduce operational costs becomes better as well.

Although CAR and NPL variables were quite significant because they had p-value that was less than 0.1, but because p-value of those two variables was more than 0.05, it can be said that those variables had no significant impact on ROA. So, CSRI, CAR, LDR, and NPL variables did not have significant impact on ROA. It can be seen from the level of significance of these variables on ROA in which p-value > 0.05 ( $\alpha = 5\%$ ). Therefore, CSRI, CAR, LDR, and NPL variables partially did not significantly impact ROA as dependent variable. Thus, H1 was rejected, CSRI did not have significant effect on company profitability. Referring to insignificant relation between CSRI variable and ROA variable, it can be said that that the higher the level of CSR disclosure calculated using CSR Index gets will not generate the higher ROA.

According to the test results of Model I, SIZE was proved to have significant positive impact on ROA. This positive relation indicated that bank size has significant positive impact on profitability, or in other words, larger banks will achieve higher profitability. These results were in line with the research of Gul, Irshad and Zaman (2011), which has proved that banks having larger size will have better ability to manage their economy, so that they will have the higher level of profitability.

Furthermore, CAR variable had enough impact on ROA (due to p-value < 10%), but tended to be insignificant (because of the p-value > 5%). Considering the bank industry that mainly depends on customer trust, then, if the community has trusted a bank, it will certainly improve the bank's performance so that it will increase the bank's profitability, and thus, the bank can operate and develop with these profits without disrupting its capital. However, in this study, banks that were selected as research samples were banks with large assets, so that public must have high trust in these banks. According to Buchory (2016), one reason why CAR variable does not have a significant impact on ROA is because there are regulations from Bank Indonesia that require banking companies to maintain CAR at safe limit (min. 8%).

The LDR variable showed that it did not have significant impact on ROA. According to Paleni, Hidayat and Jatmiko (2017), this result indicates that the amount of credit was not supported by good-quality credit. It does not matter the maximum credit or loan given by the bank. If credits are not supported by good-quality credit, then the risk that will be underwritten by the bank will also be greater. Thus, it can be said that the bank has not been optimal in providing credits or loans.

Moreover, almost the same as CAR variable, NPL variable had enough impact on ROA (due to p-value < 10%), but the impact was not significant (because of the p-value > 5%). Possible cause might be the sample banks in this study had NPL ratio below 5%, so it can be said that credit risk tends to be small.

The main independent variable in this study was CSR disclosure calculated using CSR Index. From the test results of this study which can be seen in Table 2, it was proved that CSRI variable did not have significant impact on the profitability of the company that is proxied by ROA. This is possible because the sample companies were large banks, of which images are already good according to public perception, so that CSR disclosure does not have too much impact on profitability. Basically, a good disclosure of CSR will give a company a good image, which will lead to increasing profitability of the company. However, if the bank is a large bank and has a good image already, it seems like CSR disclosure does not really play a key role in increasing profitability.

### 3.3. Regression results in research Model II

Panel data regression in Model I can be explained in detail in Table 3 below. Table 3 shows that regression coefficient C was 1.0760 with significance level of p-value 0.006 < 0.05 ( $\alpha = 5\%$ ). Overall, model can be employed to see the impact of all variables on ETR. The value of F-Statistic showed number of 10.1043 with probability value of 0.0000. Regression model can be considered to be accepted if Prob-value (F-statistic) is less than significant ( $\alpha = 5\%$ ). It means that all the variables used in Model II had been shown to have impact on effective tax rate (ETR). Therefore, the regression results in Model II showed that CSRI, SIZE, LEV, ROA, and CAPINT variables simultaneously did have impact on ETR.

#### Model II:

$$ETR_{it} = \beta_0 + \beta_1 CSRI_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 ROA_{it} + \beta_5 CAPINT_{it} + \varepsilon \quad (4)$$

Table 3. Results of regression of research Model II

Variable	Coef.	Prob.
Constanta (C)	1,0760	(0,006)*
CSR Index (CSRI)	-0,0225	(0,642)
Ukuran Perusahaan (SIZE)	-0,0262	(0,029)*
Capital Adequacy Ratio (CAR)	0,0165	(0,150)
Loans to Deposits Ratio (LDR)	0,6892	(0,162)
Non Performing Loan (NPL)	0,5624	(0,501)

Note: N = 50; Adj R<sup>2</sup> = 0,1818; Prob. = 0.0000\*; \*significant at 5% level.

Source: Data Processed by Using STATA

Regression results in Model II also showed that all variables simultaneously had significance level (R-Squared) of 0.1818 or 18.18% on ETR. Based on this finding, CSRI variable and all control variables were able to explain the variation of ETR variable by 18.18%, while the remaining 81.82% of variation of ETR was explained by other variables, or in other words, there were other factors of 81.82% which might also affect ETR of companies. However, CSRI did not have a significant impact on ETR (H2 was rejected). This is because the p-value of CSRI was 0.642 or higher than the significance value (p-value > 0.05 ( $\alpha = 5\%$ )) so partially, CSRI variable did not have significant impact on ETR, which was dependent variable.

LEV, ROA and CAPINT variables did not have significant impact on ETR either because the significance level of these variables on ETR was p-value > 0.05 ( $\alpha = 5\%$ ). Thus, partially, LEV, ROA, and CAPINT variables did not have significant effect on ETR, which was dependent variable. The result of this study is quite different from the result of research conducted by Topak and Talu (2016), which has proved that company size has significant negative impact on profitability.

In this study, from all the variables employed, only SIZE variable had significant impact on ETR. This finding can be seen from the level of significance of SIZE on ETR which was equal to p-value 0.0029 < 0.05 ( $\alpha = 5\%$ ). Therefore, SIZE variable partially had a significant impact on ETR, which was dependent variable. SIZE had negative value of coefficient in regression, which was -0.0262 or -2.62%. In other words, if the size of a company (SIZE) becomes larger, the effective tax rate (ETR) of the company will actually decrease. It also indicates that the larger the size of the company becomes, the more astute the company is in doing tax planning that might reduce effective tax rate of the company.

Besides SIZE, other variables did not have significant impact on the ETR of the sample companies. Even the main independent variable, CSRI, was proved to have no significant impact on ETR. The relation between CSR disclosure and ETR was insignificant negative, which means that the higher CSR index value gets will not have impact on ETR of the company. In summary, from the samples we took in this research, the disclosure of corporate social responsibility did not have impact on company's profitability and effective tax rate (as proxy for tax avoidance). This result is possible because companies that have implemented CSR disclosures well tend to have good corporate management.

## Conclusion

The disclosure of social responsibility that is proxied by CSR Index did not have significant impact on the profitability of the company that was proxied by ROA. This result illustrates that the better the CSR disclosure did not have impact on the level of profitability a company reach. Based on the significance level of 5%, in Model I which examined the impact of CSRI, SIZE, CAR, LDR, and NPL on ROA, it was found that only SIZE variable had significant impact on ROA. Meanwhile, other variables, including CSRI, have no significant impact on ROA. It was also found that the disclosure of social responsibility that was proxied by CSR Index did not have a significant impact on the effective tax rate of the company that is proxied by ETR. This result illustrates that CSR disclosure did by the company has not had sufficient evidence to show its impact on ETR. Based on the 5% significance level, in Model II which examined the impact of CSRI, SIZE, LEV, ROA, and CAPINT on ETR, it was found that only SIZE variables had a significant effect on ETR. While other variables, including CSRI, have no significant effect on ETR.

## Recommendation

For further research in the future, it is recommended to select sample companies of which data and information are available completely. These data and information can facilitate research process and expand research observations. In addition, it is recommended to do more in-depth research on variables that will be employed so that the research model can show significant impact and support hypotheses proposed in the study.

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## Investigating Customer Perception of Online Businesses' Service Recovery: A Combination of Expectation-Confirmation Theory, Satisfaction-Loyalty Theory, and Perception of Justice

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### Abstract:

This current study investigated the perception of Generation Z customer in the online business according to the service recovery. We combined the Perception of Justice Theory, Expectation Confirmation Theory, and Satisfaction-Loyalty Theory for the construct to investigate the Generation Z perception on service recovery. Several hypotheses were proposed and a structural equation model with confirmatory factor analysis was conducted to answer these hypotheses. A total of 158 people participated in this research. The results showed promising findings and nine out of twelve hypotheses were accepted. The correlation between Courtesy and perception of justice was revealed to have the strongest correlation. This finding indicates that Generation Z's perception of online businesses service recovery was strongly affected by how the business shows Courtesy to them. The results also showed that even though when the service recovery was judged to be satisfying for the customer, they were not likely to be loyal. Several practical and managerial interpretations were discussed. Ensuring consumers to stay loyal will help online businesses to grow and sustain.

**Keywords:** perception; online business; ECT; satisfaction-loyalty; justice theory.

**JEL Classification:** M31.

## Introduction

Customer perception is an essential aspect for businesses because it shows how customers see products or services offered by a company (Alam, Roy and Akther 2016). It could lead to customer loyalty and satisfaction (Komunda and Osarenkhoe 2012). Customer perception can have a significant effect on customer relationship; businesses have to consider this and give more attention to the easily changed perception of their customer. One way for businesses to be more attentive is to give customer appropriate treatment such as the provision of warranty for a product or service (Su and Wang 2016, Wirtz *et al.* 2000). Managers also have to confront one of today's managing customer perception challenge; when a service provider could not deliver an appropriate service to the customer or typically referred to as service failure (Khan *et al.* 2016). Service failure could affect customer perception of a business which will also affect their loyalty (Michel, Bowen and Johnston 2009, Nikbin *et al.* 2015). When service failure occurs, managers are faced with the option between responding or ignoring service failure (Harun *et al.* 2018). Clearly, choosing to respond would be a better option for managers. Responding to service failure with the intention to repair the damage is known as service recovery (Nikbin *et al.* 2015).

Service recovery is also defined as how to restore customer perception back to before service failure occurred (Bhandari *et al.* 2007). Service providers, by doing service recovery, expect to maintain customer loyalty. Unfortunately, inappropriate service recovery could even worsen the customer loyalty to the service provider; considering this, a service provider needs to understand their customer perception on the service recovery they provided (Chen *et al.* 2018). Past researches have already discussed this topic in different industries such as hospitality, banking, and aviation industry (Harun *et al.* 2018, Migacz *et al.* 2017, Ozkan-Tektas and Basgoze 2016). One industry which is lacking in similar research is the industry of online business. The online business consists of service and retail business ranging from an online shop, commercial online education, online ticketing, online financial services, and other business utilizing internet connectivity (Lien *et al.* 2015, Bawa 2016, Çizel *et al.* 2015, Wardhana and Kartawaniata 2016, Lee and Shin 2018). The trend of online businesses itself keeps increasing over the years, marked by the growth of online services revenue at 9,2% in 2016 (US Census Bureau 2018). Considering the lack of service recovery research and the significance of online businesses in the future, this paper will try to measure customer perception toward online business recovery.

Many previous studies to online business were explored by utilizing descriptive method; having the purpose of understanding process in a research subject, this method is deemed unsuitable for research investigating customer perception which demands Explanation regarding the relationship between variables such as brand reputation, employee attitudes, and service quality (Chen and Chang 2003, Marhayanie *et al.* 2017, Eastlick *et al.* 2006, Parasuraman and Zinkhan 2002). Understanding customer perception could be assessed by theoretical approach, using reliable models and theories such as Theory of Planned Behavior (TPB) and Perception of Justice, both able to explain the relationship between customer perception variables (Aboelmaged and Gebba 2013, Mansori *et al.* 2014, Choi and Choi 2014).

A service recovery, when able to change customer perception from dissatisfied to satisfied, is considered a successful service recovery (Park and Park 2016). Expectation-confirmation theory could be used to understand factors causing customer satisfaction towards service recovery; evaluating the gap between customer expectation and perceived performance (Lin *et al.* 2005). Extending this model, another framework called satisfaction-loyalty could be used to also understand the customer loyalty recovery after a satisfying service recovery has been done (Fu *et al.* 2018). Understanding factors other than the gap of expectation and confirmation is also important, especially factor related to how customers see the totality of the service recovery. To do this, another framework called perception of justice to understand customer's acceptance and judgment towards fairness in the service recovery activity such as the speed of recovery response (Response Speed), employee apology (Apology), Explanation, employee courteousness (Courtesy), and problem solving (Khan *et al.* 2016, Choi and Choi 2014).

This current research investigated the perception of Generation Z customer in the online business according to the service recovery. We combined the Perception of Justice Theory, Expectation Confirmation Theory, and Satisfaction-Loyalty Theory for the construct to investigate the Generation Z perception on service recovery. The rest of the article is grouped into four sections. Section two reviews the existing literature related to the combined conceptual framework – the perception of justice, satisfaction-loyalty theory, and expectation-confirmation theory. The following section provides a profile of the data and methodology. In the next section, the research results are conferred and analyzed, the hypotheses tested, and managerial implication also discussed. The last section will summarize the findings and also provides suggestions for future research.

## 1. Literature review

### Generation Z

Generation Z is the generation that is born between 1997 to 2003; this means that they are 16 to 22 years old today. Generation Z is known for their extensive familiarity with internet access and social media (Merriman 2005, Duffet 2017). They are also known for their particular traits: having the ability to plan before doing something, a more structured way of thinking, and having adequate self-control. These characteristics, combined with how Generation Z have their own sense of marketing, should be considered by service providers in order to provide better services (Williams *et al.* 2014). Peer acceptance is also an important aspect for understanding Generation Z, they are seen as individuals who value peer acceptance (Williams *et al.* 2014). One research even showed that 46% of Generation Z considers the recommendations and opinions of their peers when choosing a brand (IBM 2017). The present research utilized these unique facts regarding Generation Z to supports the present research hypotheses.

### Expectation-Confirmation Theory (ECT)

Expectation-confirmation theory (ECT) is used to explore customer satisfaction by evaluating initial expectation and the comparison between expectation and actual performance of a product and service (Oh 1999, Lin *et al.* 2011). Customer expectation is created when a product or service is offered. After the customer expectation is established, the customer then will compare their expectation with what they get from the product (Fu *et al.* 2018). When the actual performance aligns with the expectation, confirmation is created. Alongside expectation, this confirmation will lead to customer satisfaction (Lin *et al.* 2005). The complete model structure is visualized in Figure 1.

Figure 1. Expectation-confirmation theory



Source: This figure is adapted from Fu *et al.* (2018)

### Satisfaction-Loyalty Theory

The Satisfaction-loyalty theory explains the interrelated relationship between satisfaction and loyalty, this theory is applied successfully in many fields with the purpose of understanding customer loyalty (Lin *et al.* 2005). In this study, loyalty is defined as the result of customers' satisfaction from online business service recovery. Past researches found that satisfaction had a positive relationship with loyalty. Figure 2 shows the Satisfaction-loyalty model. (Kim *et al.* 2013, Schirmer *et al.* 2016).

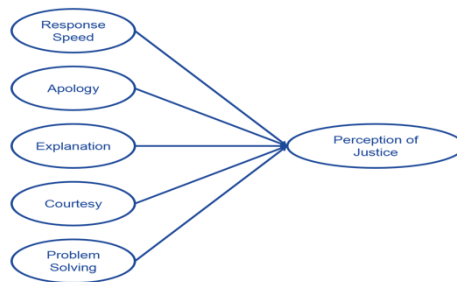
Figure 2. Satisfaction-loyalty theory



### Perception of justice

Perception of justice is how an individual evaluates the level of 'justice' they get from a particular thing or processes (Choi and Choi 2014, Khan *et al.* 2016). In this study, perception of justice is defined as the evaluation of online business service recovery by customer. There is three perception dimension in the context of justice that is commonly assessed by customer: distributive, procedural, and interactional justice (Ozkan-Tektas and Basgoze 2016). Distributive dimension is evaluated when a customer perceives justice in the form of recovery compensation given by service provider (Lin *et al.* 2011, Karatepe 2006). Procedural dimension is evaluated when a customer perceives justice from a particular procedure and policy done by a service provider; usually represented by employee responsiveness or Response speed (Khan *et al.* 2016, La and Choi 2019, Borah *et al.* 2019). Interactional dimension is evaluated when a customer perceives justice from the service provider' employee attitude, it is usually related to how service provider provides information and shows their concern in their process of service recovery; shown by Apology, Explanation, Courtesy, and Problem-Solving (Harun *et al.* 2018, Radu *et al.* 2019). The relationship of these dimensions can be seen in the model shown in Figure 3.

Figure 3. Perception of justice



Source: This figure is adapted from Harun *et al.* (2018)

### Conceptual model structure

This current research utilized Expectation-Confirmation Theory, Satisfaction-Loyalty Theory, and Perception of Justice. The integrated model and hypothesized relation among the variables is shown in Figure 4. The previous research found that customer expectation positively related to Confirmation and Satisfaction (Thong *et al.* 2006, Oghuma *et al.* 2016). Thus, these hypotheses were proposed:

- H<sub>1a</sub>:** Generation Z' confirmation was positively influenced by their expectation on service recovery of the online business;
- H<sub>1b</sub>:** Generation Z' satisfaction was positively influenced by their confirmation of the online business;
- H<sub>1c</sub>:** Generation Z' satisfaction was positively influenced by their expectation of service recovery given by the online business.

This current research explored procedural justice and interactional justice to represent the perception of justice. Procedural justice could be represented in the form of Response speed; shown a positive relation toward the perception of justice in the previous research (Borah *et al.* 2019). To represent interactional justice, this current research utilized Apology, Explanation, Courtesy, and Problem-solving. An apology was shown a positive influence on the perception of justice. (Radu *et al.* 2019). Previous research proved that Explanation could also positively influenced the perception of justice (Mattila and Patterson 2004). The previous research showed that Courtesy had a positive influence on the perception of justice (Harun *et al.* 2018, Van Der Heijden *et al.* 2013). Following these previous research, Problem-solving was shown that positive influence towards the perception of justice (Van Der Heijden *et al.* 2013, Harun *et al.* 2018). Thus, these following hypotheses were proposed:

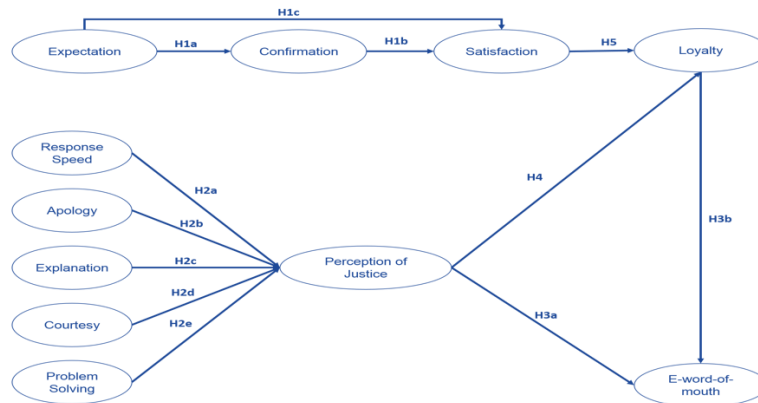
- H<sub>2a</sub>:** Response speed had a positive influence on Generation Z' perception of justice towards service recovery;
- H<sub>2b</sub>:** Apology had a positive influence on Generation Z' perception of justice towards service recovery;
- H<sub>2c</sub>:** Explanation had a positive influence on Generation Z' perception of justice towards service recovery;
- H<sub>2d</sub>:** Courtesy had a positive influence on Generation Z' perception of justice towards service recovery;
- H<sub>2e</sub>:** Problem-solving had a positive influence on Generation Z' perception of justice towards service recovery.

Customer perception could also affect customer's post-recovery behavior such as electronic-word-of-mouth (eWOM) and loyalty. In this current research, eWOM was defined as the remark a customer gave about their response toward the online business' service recovery in online media. According to the previous research, eWOM could be positively influenced by loyalty and perception of justice (Choi and Choi 2014, Kim *et al.* 2013). Hence, the following hypotheses were proposed:

- H<sub>3a</sub>:** Perception of justice towards service recovery is having a positive influence on Generation Z' eWOM;
- H<sub>3b</sub>:** Loyalty towards online business has a positive influence on Generation Z' eWOM.



Figure 4. Conceptual model structure



Source: own preparation.

When the perception of justice is positive, the customer will more likely to show tolerance towards the failure that has been done by a service provider and could positively affect customer loyalty (Bhandari *et al.* 2007, Harun *et al.* 2018). Thus, the following hypotheses are proposed:

**H<sub>4</sub>:** Perception of justice towards service recovery has a positive influence on Generation Z' loyalty

In this current research, loyalty is defined as the result of customer satisfaction towards service recovery. Several previous research has proven that satisfaction is having a positive relationship with loyalty (Kim *et al.* 2013, Schirmer *et al.* 2016). Therefore, the following hypothesis is proposed:

**H<sub>5</sub>:** Loyalty towards service recovery in online business is positively influenced by satisfaction towards service recovery.

## 2. Methodology

The current study utilized Partial Least Squares Structural Equation Modeling (PLS-SEM) to evaluate the effects of Gen Z's perception of justice to their e-word-of-mouth. We conducted a survey to 158 Gen Z in Indonesia. The PLS-SEM was facilitated by SmartPLS 3 Software. The instrument development was a questionnaire, where the question mostly adapted from Harun *et al.* (Harun *et al.* 2018) as well as Lawan and Kabir (Lawan and Kabir 2014). There were 45 indicators which represent 11 variables. The measured variable uses Likert scale with a five-point scale, as 1 indicates "I strongly disagree" and 5 indicates "I strongly agree" (Prasetyo *et al.* 2014).

The sampling process was conducted by using multiple cross-sectional designs. We utilized purposive sampling; a form of non-probabilistic sampling to choose or samples. The requirement was that the respondents were a part of Generation Z age boundary and had encountered a service recovery experiences in an online business. Twelve evaluation for the hypotheses were tested. Several tests such as data fit test and model fit were also conducted. The data tests were consisted of reliability and convergent validity. The model fit test consisted of several instruments such as SRMR, d<sub>G</sub>, NFI, and Chi-square (Lin *et al.* 2018).

## 3. Case studies

### 3.1. Data analysis

Our respondents (n=158) consisted of 60 males and 98 females. Our 158 respondents were identified as Generation Z since they were born between 1997 to 2001. As presented in Table 2 these respondents were dominated by them who was born in 1998. The questionnaire included behavioral questions regarding their online business transaction frequencies within these three months in the time of our study. According to that question, we could found that most Generation Z (67 people which is equal to 42.4%) had less than three times online business transaction within these three months. These respondents also helped us to identify the online business offerings they were likely to use the most was food sector (115 people or equal to 67.6%) and the second was transportation sector (111 people or equal to 65.3%) as presented in Figure 5.

Table 1. Respondents demography: Gender

		Frequency	Percent
Valid	Male	60	38,0
	Female	98	62,0
	Total	158	100,0

Source: own preparation

Table 2. Respondents Demography: Year of Birth

		Frequency	Percent
Valid	1997	48	30,4
	1998	87	55,1
	1999	16	10,1
	2000	3	1,9
	2001	4	2,5
	Total	158	100,0

Source: own preparation.

Figure 5. Online business offering



Source: own preparation.

The reported offerings also included fashion, electronic, financial, music, and education. Mostly, our respondents were reported to contact the online business' customer service less than ten times (152 people or equal to 96.2%) and the rest were reported to contact the online business' customer service approximately 11-25 times.

After the data were collected, we conducted a validity and reliability test for the measurement model (Lin *et al.* 2018, Lin and Prasetyo 2019). First, we examined the factor loading of the indicators. This factor loading minimum adequate value is 0.7, it means that this factor is valid if the factor loading is greater than 0.7 (Choi and Kim 2016). If this factor loading surpasses 0.7, it indicates that the variables measure similar concepts. Then, we also conducted validity and reliability test for 11 variables. The assessment uses several approaches such as Cronbach's Alpha, composite reliability, and Average Variance Extracted (AVE). Cronbach's Alpha as a common measurement of reliability can be used to determine the internal consistency aspect for the indicator in the construct. The minimum requirement for Cronbach's Alpha is 0.7 (Persada *et al.* 2019). Another reliability measurement to support Cronbach's Alpha is Composite Reliability (CR), which will assess the measurement error for the items (Dijkstra and Henseler 2015, Shook *et al.* 2004). The minimum requirement for Composite Reliability is 0.7 (Persada *et al.* 2019). We also assessed the model using the Average Variance Extracted (AVE). AVE is determined by examining the outer loadings of the indicators. The minimum requirement for AVE is 0.5. The greater the AVE means greater the indicator variance is included in the construct (Hair Jr *et al.* 2017).

Table 3 shows the summary of our questionnaire reliability result for each factor in this online questionnaire. The first variable, Apology consisted of four parameters which were expressed as A1, A2, A3, and A4. The second variable was Courtesy which had four observed parameters: C1, C2, C3, and C4. The third variable was confirmation which also had four observed parameters: CF1, CF2, CF3, and CF4. The following variable was Explanation that had four parameters: E1, E2, E3, and E4. Another variable was e-word-of-mouth which had three parameters: EW1, EW2, dan EW3. The seventh variable was expectation that had four parameters: EX1, EX2, EX3, and EX4. The eighth variable was perception of justice which had seven parameters: J1, J2, J3, J4, J5, J6, and J7. The following variable was loyalty which had three parameters: L1, L2, and L3. The other variable was Response speed which had four parameters: R1, R2, R3, and R4. The last variable was satisfaction which had five parameters: S1, S2, S3, S4, and S5. All of the 45 variables' factor loading exceeded the minimum value indicating that 45 items measure had the similar concepts with variables and valid enough to explain Apology, Courtesy, Confirmation, Explanation, E-Word-Of-Mouth, Expectation, Perception of Justice, Loyalty, Problem Solving, Response speed, and Satisfaction. Table 4 illustrates the result of validity and reliability test. Cronbach's Alpha

results of the 11 variables were varied between 0.733 and 0.925. These ranges were higher than the minimum threshold of Cronbach's Alpha ( $>0.7$ ) indicating that these 11 variables were valid and reliable. Table 4 also presents the result of composite reliability that varied between 0.860 and 0.946. This range also exceed the minimum threshold of Composite Reliability ( $>0.7$ ) indicating that these 11 variables were reliable. AVE was found range between 0.733 and 0.815 indicating that these 11 variables are valid and reliable.

Table 3. Factor loading

Factor	Item	Factor Loading	Factor	Item	Factor Loading
Apology	A1	0.890	Perception of Justice	J1	0.799
	A2	0.885		J2	0.857
	A3	0.926		J3	0.782
	A4	0.910		J4	0.862
Courtesy	C1	0.794		J5	0.855
	C2	0.923		J6	0.812
	C3	0.917		J7	0.888
	C4	0.914	L1	0.887	
Confirmation	CF1	0.854	Loyalty	L2	0.834
	CF2	0.874	L3	0.732	
	CF3	0.908	Problem Solving	PS1	0.873
	CF4	0.929		PS2	0.885
Explanation	E1	0.883		PS3	0.902
	E2	0.908	Response speed	R1	0.866
	E3	0.903		R2	0.842
	E4	0.887		R3	0.897
E-word-of-mouth	EW1	0.863		R4	0.785
	EW2	0.898	Satisfaction	S1	0.825
	EW3	0.924		S2	0.805
Expectation	EX1	0.733		S3	0.819
	EX2	0.839		S4	0.812
	EX3	0.825		S5	0.851
	EX4	0.853			

Source: own preparation.

Table 4. Validity and reliability test results

Variables	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Apology	0,925	0,933	0,946	0,815
Confirmation	0,914	0,917	0,940	0,795
Courtesy	0,910	0,909	0,937	0,790
E-word-of-mouth	0,876	0,879	0,924	0,790
Expectation	0,829	0,836	0,887	0,790
Explanation	0,918	0,925	0,942	0,790
Loyalty	0,756	0,775	0,860	0,790
Perception Of Justice	0,928	0,930	0,942	0,790
Problem Solving	0,865	0,866	0,917	0,790
Response speed	0,869	0,871	0,911	0,790
Satisfaction	0,880	0,881	0,913	0,790

Source: own preparation.

The following tests are model fit tests. SRMR, d\_G, NFI, and chi-square are some commonly instruments to measure the model fit. Table 5 shows that all of the four parameters are proven to be adequately fulfill the required value, therefore the integrated model that proposed could be stated as a fit model.

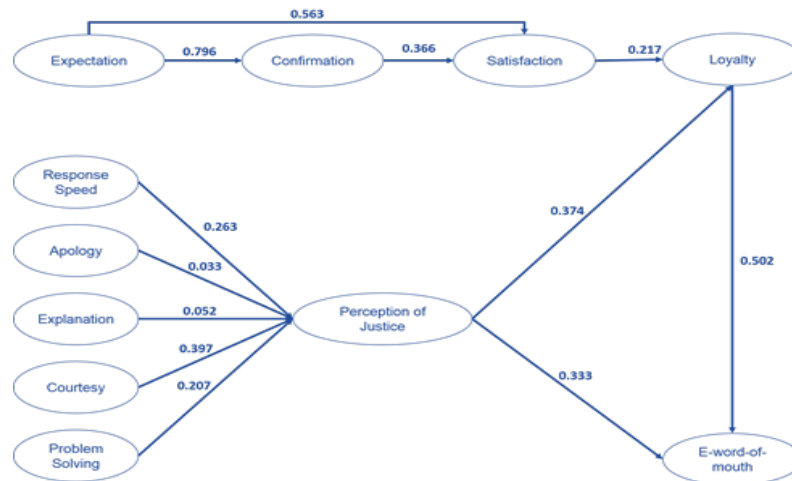
Table 5. Results of Model Fit Test

Model Fit parameters	Result	Required adequate value
SRMR	0.062	0.05 < SRMR < 0.10 (Suhaily and Soelasih 2018)
d_G	0.243	<2.824
NFI	0.734	>0.7 (Arifin <i>et al.</i> 2018)
Chi-square	1.953	<3.0 (Mindrila 2010)

Source: own preparation.

After testing the model fit, hypotheses were being analyzed in the following stage. Figure 6 shows path coefficients results in the constructs. Response Speed was found had a positive correlation with the value of 0.263 to the Perception of Justice.

Figure 6. PLS Path model and results



Source: own preparation.

The following positive correlation also found in the correlation between Apology and Perception of Justice with the value of P Value is 0.033, Explanation and Perception of Justice with the P Value of 0.052, Courtesy and Perception of Justice with the P Value of 0.397. Problem Solving showed a positive correlation with the Perception of Justice with a value of 0.207. In addition, Expectation was found had a direct positive correlation to confirmation ( $\beta=0.796$ ) and an indirect positive correlation to satisfaction ( $\beta=0.563$ ). Confirmation showed a positive relation to satisfaction ( $\beta=0.217$ ). Perception of Justice also showed a positive relation to loyalty ( $\beta=0.374$ ) and e-word-of-mouth (Beta=0.333). Loyalty also had a positive relation to e-word-of-mouth with value of 0.502. Yet when we compared Figure 6 with table 6 which showed P value for each hypothesis. As this table shows P Value between Apology and Perception of Justice is 0.615 which greater than the maximum threshold (P Value=0.100). It means that hypothesis 2b is rejected. The amount of P Value for Explanation and Perception of justice relationship is 0.375 which could also lead to the rejection of hypothesis 2c. Relationship between Satisfaction and Loyalty is represented as the P value for this relationship is 0.135 which also leads to the rejection of hypothesis 5.

Table 6. Hypotheses test results

Hypothesis	Sample Mean	Standard Deviation	P Values	Explanation
Expectation → Confirmation (H <sub>1a</sub> )	0.798	0.037	<0.001	Supported
Confirmation → Satisfaction (H <sub>1b</sub> )	0.361	0.071	<0.001	Supported
Expectation → Satisfaction (H <sub>1c</sub> )	0.569	0.065	<0.001	Supported
Response speed → Perception of Justice (H <sub>2a</sub> )	0.268	0.082	<0.001	Supported
Apology → Perception of Justice (H <sub>2b</sub> )	0.033	0.065	0.615	Rejected
Explanation → Perception of Justice (H <sub>2c</sub> )	0.056	0.059	0.375	Rejected
Courtesy → Perception of Justice (H <sub>2d</sub> )	0.383	0.085	<0.001	Supported
Problem Solving → Perception of Justice (H <sub>2e</sub> )	0.213	0.071	0.004	Supported
Perception of Justice → EWOM (H <sub>3a</sub> )	0.332	0.064	<0.001	Supported
Loyalty → EWOM (H <sub>3b</sub> )	0.506	0.076	<0.001	Supported
Perception of Justice → Loyalty (H <sub>4</sub> )	0.371	0.140	0.008	Supported
Satisfaction → Loyalty (H <sub>5</sub> )	0.224	0.145	0.135	Rejected

Source: own preparation.

### 3.2. Managerial implication

This current research has discussed how the integrated model of Perception of Justice, ECT, and Satisfaction-Loyalty Theory could be used to analyze Generation Z perception from the statistical interpretation and managerial implication. According to the analysis, the result founds that this model combination illustrated the 50.2% of post-service recovery intention (e-word-of-mouth). Focusing on the Perception of Justice dimension, Hypothesis 2d (Courtesy->Perception of justice=0.397) has the highest value of path correlation to the Perception of Justice compared to other perception of justice. This indicates that Generation Z's perception of service recovery is strongly affected by how the business shows Courtesy to them. The online business as to conduct a Standard Operational Procedure according to this Courtesy of their staffs to cope with service recovery perception.

This current research also found that three of twelve hypotheses are rejected. A significant rejection come from hypothesis 2b (Apology->Perception of justice). This shows that Generation Z's perception of service recovery is not affected by how the business apologizes according to its service failure. This kind of Generation Z's behavior needs to be treated differently. Sometimes, they require compensation as Apology evidence from the business. An online business needs to consider this compensation in the dimension of their service recovery.

We also found another rejected hypothesis. The hypothesis 2c (Explanation->Perception of Justice) is rejected. This indicates that Generation Z's perception of justice is not affected by how the online business explains why could the service failure happened to them. It means that Generation Z requires a different treatment from the online business. Sometimes, Generation Z prefers certainty rather than only an Explanation. An online business should offer them certainty on how the online business solves service failure.

The last rejected hypothesis is hypothesis 5 (Satisfaction->Loyalty). The results show that even when the service recovery succeeded to satisfy customers, they still do not have the tendency to be loyal. This current research is focusing on online business. This result does make sense because of the online business ecosystem is relatively competitive. This industry's customers have quite a significant bargaining power since these customers have several options for online business. This online business needs to maintain its competitive advantage at least equal to its competitor. An online business could also conduct some programs that will manage customer retention.

### Conclusion

This current research investigated the perception of Generation Z customer in the online business according to the service recovery. We combined the Perception of Justice Theory, Expectation Confirmation Theory, and Satisfaction-Loyalty Theory for the construct to investigate the Generation Z perception on service recovery. We evaluated the model's constructs based on these three currently existing theories and conducted a data-driven approach. 158 data were collected from Generation Z respondents. The results showed that the combined model able to depict 50.2% of total Generation Z post-service recovery intention (e-word-of-mouth). Among the twelve hypotheses, nine hypotheses were accepted. The first insight from this current research is online business has to conduct a Standard Operational Procedure according to the Courtesy of their staffs to cope with service recovery as Courtesy showed a significant effect to the Generation Z's service recovery perception.

Second, Generation Z requires a different treatment in service recovery, an online business also needs to consider the compensation in the dimension of their service recovery. Finally, Generation Z requires not only an Explanation but they also require an online business to offer them certainty on how the online business solves the service failure. As this current research has a result that satisfaction is not significantly affecting customer loyalty, online business need to maintain its competitive advantage at least equal to its competitor to retain its customer loyalty.

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## International Capital Inflows and Poverty: Evidence from Developing Countries

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### Abstract:

Poverty reduction is an important one of the long-term global goals. This paper analyses the impact of international capital inflows on poverty with a sample covering 26 developing countries in the Asia-Pacific region. A panel dataset is collected over the period of 1980-2015. The results conclude some new findings, which show international capital inflows have two kinds of effects on the poverty rate. The result shows that remittances and trade openness has positive effects on the poverty rate of the economies. On the other hand, external debt and official development assistance have negative effects on poverty in the region. Our findings lead to some valuable implications, in which, the policymakers need more careful when using the external debt as well as official development assistance to support economic growth because these tools can make the more serious on the poverty in countries. However, the policymakers can use the remittances as an important international capital to solve the lack of internal financial resource. Besides, the result points out that trade openness is a good tool for decreasing the poverty rate by trading with the outside.

**Keywords:** international capital; remittances; external debt; official development assistance; trade openness; poverty; panel regression; developing countries; Asia-Pacific region.

**JEL Classification:** B55; E44; F15; I32.

### Introduction

Poverty remains one of the world's biggest challenges in the long run. The extreme poverty rate has sharply decreased since the 90s, however, many people are still stuck in the worst forms of poverty over the world. Repealing poverty is a mission need many endeavors of governments in the long run. Despite the continuous improvement in productivity as well as output growth is accelerating worldwide, however, poverty still popularly persists in many countries and even in some large regions. According to estimates from the World Poverty Clock (the world poverty statistics website by World Data Lab International Statistics), in January 2018 the world had about 8.3% (as 621.47 million people) live in extreme poverty with expenditure less than 3.2 USD per day. Data from this website show that the world has 16.4 thousand people per day out of poverty, but in the opposite direction, there are more than 5.5 thousand people/day fell into extreme poverty.

The statistics of the World Poverty Clock clearly show that poverty has been constrained when the number of people out of poverty is three times higher than the number of people falling into poverty at the same time. Besides the progressive areas in the fight against poverty, many countries around the world are still struggling in fighting poverty, however, many people are still suffering from severe hunger. According to the report of the United Nations (2018), the year 2017 is the third consecutive year that the world witnessed the increasing of hunger as well as the number of malnourished people. About 11% of the world's population, equivalent to 821 million people, are in serious food shortage. These are statistics that imply that poverty continues to be a serious global problem in the coming decades.

Thus, poverty, poverty reduction and the causes of falling poverty rate, are still the top topics of interest of policymakers as well as in academic in the world. However, there are some countries or regions that stand out in poverty reduction achievement. The statistics of the Asian Development Bank (ADB) have also demonstrated clear evidence that the Asia-Pacific region continues to make steady progress in reducing poverty and improving the infrastructure as well as increase participation in global production networks. Specifically, during the period from 2002 to 2013, about nearly 780 million people in this area were escaped extreme poverty. Furthermore, in 2018,

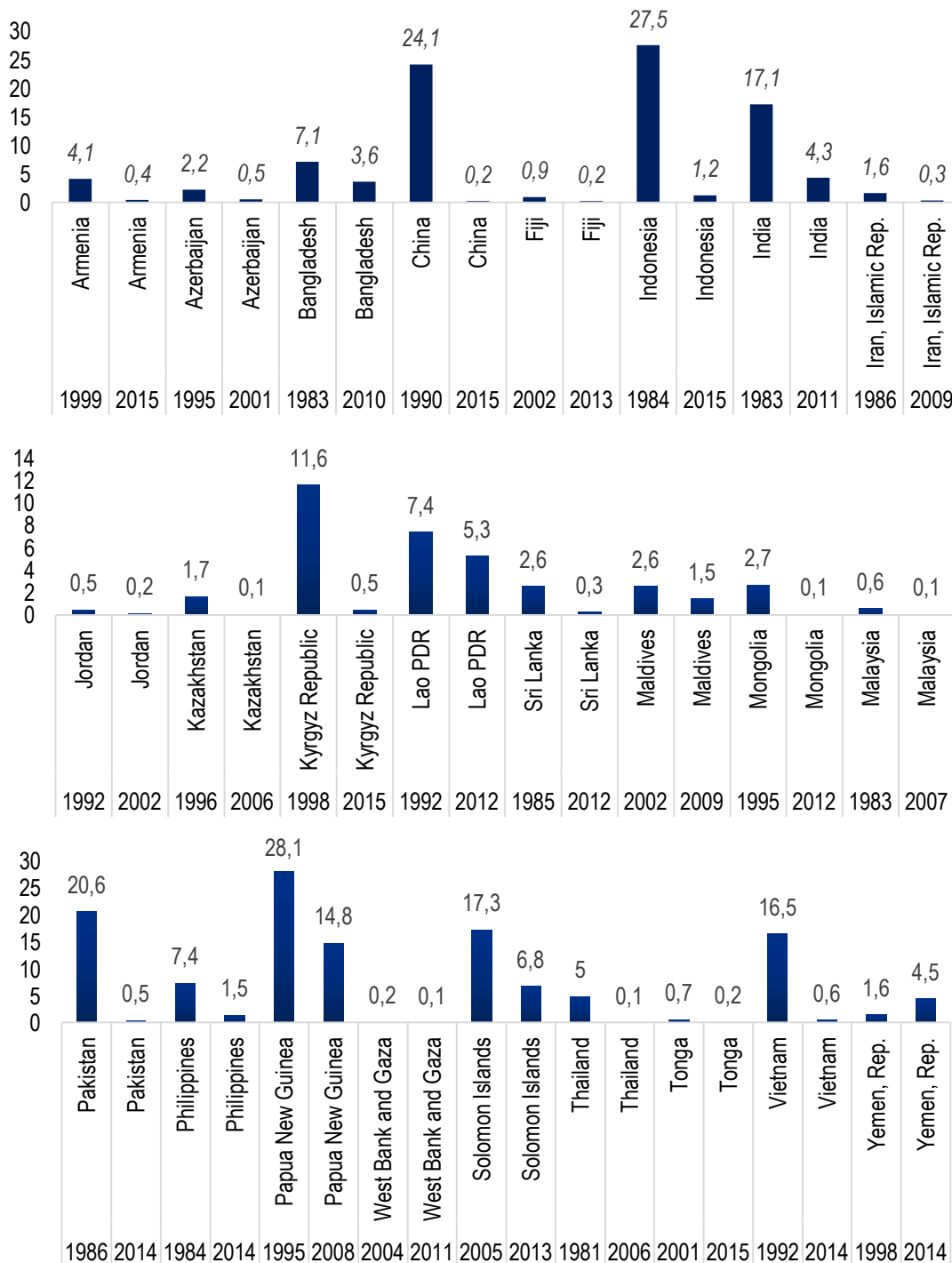
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according to estimates from the Economic and Social Committee for Asia and the Pacific (ESCAP), the Asia-Pacific region where produces 40% of GDP has been put at the highlighted position on the poverty reduction field. Besides, if the countries in the Asia-Pacific region increase spending on education, health and social protection to matching the global averages, the result is very impressive when around 328 million people will be lifted out of moderate poverty and 52 million will move out of extreme poverty in the next years.

In the Asia-Pacific region, some countries have especially recorded in reducing the poverty rate, for example, China reduced the rate of poverty at 24.1% population in 1990 to 0.2% in 2015, Indonesia dropped from 27.5% in 1984 to 1.2% in 2015, the Kyrgyz Republic from 11.6% in 1998 to 0.5% in 2015, or Vietnam was at 16.5% in 1992 to 0.6% in 2014 (World Bank 2018). Besides, the statistics of the World Bank showed that the poverty rate has decreased rapidly and in large areas in many countries in the Asia-Pacific region (see Figure 1).

Figure 1. A comparison in poverty rate in the Asia-Pacific region (Unit: %)



Source: World Development Indicators (World Bank 2018).

In addition, the Asian Development Bank also stated that the governments in the Asia-Pacific region have taken actions towards sustainable poverty reduction through the improving the economic environment, development of private enterprises, upgrading education and creating jobs.

The fight against poverty, as well as the goal of poverty reduction, is really a long-term effort. Poverty reduction is a difficult mission in many countries, however, the risk of falling back into poverty is also quite high if governments are not cautious about their policies. The general formula for poverty reduction can be understood by the efforts to improve productivity, increase capital, improve the quality of education, etc. However, some countries are still stuck in the vicious cycle of poverty because economies have high poverty rates are usually lacking capital as well as low efficiency in capital using. The domestic financial resources are very small and almost impossible to increase, forcing countries with high poverty rates to rely on external capital flows. So the international capital inflows are very important not only to decrease poverty in the short run but also destroy the vicious cycle of poverty in the long run.

Because poverty always is a highlighted problem over time. So there are intensively and controversially discussed whether international capital inflows of recipient countries really help in alleviating poverty. The decrease in the poverty rate has become one of the most concerned topics in recent decades. There are amongst of the empirical studies focusing on this issue as well as some studies provide suggestions for the policy-making process in order to reduce the poverty rate. Thus, there are some questions need for discussion. For example, "Are all of the international capital inflows well for recipient countries in reducing poverty?" or "Which international capital inflows are good for reducing poverty?". However, the previous research results have not got really clear evidence about the impact of international capital flows on poverty reduction in recipient countries. Therefore, based on impressive poverty reduction achieved in the past decades, in this paper, we will use a research sample collected from the Asia-Pacific developing countries to clarify the impact of resources from outside on poverty in this region during the period 1980-2015. There are 26 countries will be collecting data to conduct research.

Nowadays, despite the global consensus to enhance poverty reduction, which is one of the top priorities in development cooperation and integration, however, there are many doubts about the efficiency of policies which are operated by governments worldwide. So the evidence from the Asia-Pacific region is expected to have a good reference for policymaking progress as well as the operation of international co-integration in the effort to reduce poverty in the next decades. Besides regarding the policy implications, the results of our study also provide further evidence for the theoretical framework of poverty reduction as well as the role of international capital flows in poverty reduction in related academic fields.

Our article is structured in 5 sections. The second section is the literature review, which provides relevant researches. Section 3 presents the econometric model, methodology and data description of the research. Section 4 reports the result of quantitative research and discussion. Finally, conclusions and some policy implications are provided in Section 5.

## 1. Literature review

Poverty is a long-term problem for mankind, so there are a lot of arguments about how a country can escape (or reduce) from poverty. Many research results support the using of international capital inflows as a core solution to win the vicious cycle of poverty and thereby reduce poverty in a sustainable way. There have been a number of studies on this topic, however, their results are not consistent on how to help a country or a region can reduce poverty.

In order to against the vicious cycle of poverty, Ramzan and Ahmad (2014) analysis the effect of external debt on economic growth in the case of Pakistan. The authors collect an annual database in the period of 1970–2009. The empirical result points out that external debt may have a harmful effect on growth (and maybe more serious in the poverty situation). However, the adverse impact can be minimized if the economy has good macroeconomic policies. Zaghdoudi and Hakimi (2017) explore the effect of external debt on poverty in some developing countries in 2000-2015. The study result confirms the existence of a positive and significant relationship between poverty and external debt in the long run. By applying the Granger-causality method, the authors find a bidirectional causality amongst external debt and poverty in both the short run and long run. Finally, their paper provides a view which presents the external debt resulting in increasing poverty in developing countries.

Official development assistance (development aid) is financial funding given by governments and other agencies to support the growth, economic environmental or social development in developing countries. It can be noted as a one in the largest external capital resources into developing countries. Minasyan *et al.* (2017) have a study which compares the impacts of quality-adjusted aid and unadjusted aid on changes in GDP per capita with a panel data of countries. The authors note that quality-adjusted effectiveness is very important in using the aid.

The result implies that only recipient countries which have high-quality effectiveness can increase their GDP per capita by the benefits of aid inflows. The authors conclude that the quality of aid matters depends on the sample of recipient countries. Cheng *et al.* (2018) focus on the relationship between official debt restructuring and macro indicators of recipient economies. Their study result concludes that more generous in restructuring conditions relating an increase in the growth of GDP per capita as well as a reduction in poverty and inequality.

In recent decades, remittances have been on a way to become the largest source of external financing into developing countries. Combes and Ebeke (2011) investigate the effect of remittances on the instability of household's consumption with a panel database collected from developing countries. Their results find remittances can reduce the consumption instability of households. In detail, remittances have a role as insurance funding by decrease the impacts of various sources of consumption instability in developing countries (e.g., financial crises or agricultural shocks). So, the evidence of paper implies that remittances maybe reduce poverty through help the stability of the household's consumption. Tung *et al.* (2015) note that remittance is one of the most important external sources flowing into developing countries. The authors find that remittances inflow significantly raise inflation as well as exists a one-way Granger causality from remittances to inflation. This evidence leads to a worrying argument that remittances may be hurt the poor people through increasing the general price level.

Furthermore, Akobeng (2016) explores the effectiveness of remittances on inequality and poverty in Sub-Saharan Africa countries. The study finds that remittances have a reducing effect on poverty, however, the size of the poverty reduction much depends on the measured kind of poverty. Besides, trade openness is found having a positive impact on the poverty rate. Finally, the paper implies that a good financial sector can support the effectiveness of remittances in Sub-Saharan Africa. In a study in the region-level, Tung (2018) shows that the Asia-Pacific region is the largest received-remittance region compares others. Besides, the estimated results strongly indicate new evidence that remittance inflows have a negative effect on the trade balance of the countries in the study sample. This evidence is explained that the increasing trend of remittance inflows can make a rising in the trade deficit in this region.

Besides, international trade plays a very important role with economies in the context of globalization. Naranpanawa *et al.* (2011) analysis the relationship between trade liberalization and poverty in the case of Sri Lanka. The authors point out that the liberalization of the manufacturing industries is more helpful for reducing poverty than that of the agricultural industries. The empirical result implies that the innovations in the trade can widen the income gap between the rich and the poor people because of the unequal benefits across different household groups in Sri Lanka. The authors' suggestions emphasize short-term policies might focus on supporting the vulnerable income groups, in the other hand, the long-term policies can enhance trade liberalization more inclusive as well as fair to maintain both economic and political stability in this economy.

Furthermore, Tsai and Huang (2007) investigate the impact of economic growth, openness, and the role of government contribute to poverty alleviation in Taiwan in the period of 1964–2003. The authors find that sustained economic growth is the major driving force for poverty reduction as well as openness (trade with outside) helps to decrease the poverty by both direct distribution effect and indirect growth effect. These effects are worked in both the long run and short run. Goff and Singh (2014) argue that the impact of trade openness on poverty reduction is ambiguous in the theoretical literature. In order to have evidence help resolve this ambiguity, the authors examine whether the impact of openness on poverty relating to some macroeconomic characteristics. A panel database of African countries is collected over the period 1981-2010. The result concludes that an increase in trade openness level leads to a reduction in poverty in countries in the context the financial sectors are deep, education levels high as well as institutions strong. Liyanaarachchi *et al.* (2016) conclude that a 100% tariff-cut lead to an increase in economic growth and a reduction in poverty incidence both in the short run as well as in the long run. This effect is done without any fiscal policy adjustments. However, the research result also indicates that trade liberalization may raise income inequality in Sri Lanka.

In a recent study, Neaime and Gaysset (2017) exam the impact of financial inclusion on poverty and inequality in the Middle East and North Africa (MENA) countries. The study sample is collected from eight MENA countries in the period of 2002–2015. The authors find that financial inclusion decreases inequality, however, population size and inflation are found to raise inequality in this region. Besides, their result concludes that financial inclusion has no effects on poverty, on the other hand, trade openness is shown to significantly raise poverty. With this finding, the authors note that international trade maybe makes poverty more serious in the Middle East and North Africa countries.

## 2. Methodology and data

### 2.1. Methodology

Following some previous studies, there are some variables which can be considered in the group of international capital variables including foreign direct investment, remittance inflow, external debt, official development assistance. However, foreign direct investment has much evidence so it will be cut out our econometric model. Three remaining variables will be added to the poverty model as the international capital variables. Besides, international trade is very important for reducing the poverty rate so this variable also will put in the model in order to analyze the impact of international trade on poverty in the case of developing countries. The international trade will be denoted by trade openness variable. The research model is implemented in the form as follows:

$$\text{Poverty}_{i,t} = \beta_0 + \beta_1 \text{Remittances}_{i,t} + \beta_2 \text{External\_debt}_{i,t} + \beta_3 \text{ODA}_{i,t} + \beta_4 \text{Openness}_{i,t} + \varepsilon_{i,t} \quad (1)$$

where: Poverty is measured by the poverty rate, Remittances is the remittance inflow, External debt is the foreign debt, ODA is the official development assistance, and Openness is the trade openness measures the international trade of the economy and  $\varepsilon_{i,t}$  is the error term. Besides,  $t$  denotes time periods, and  $i$  is cross-sectional units with  $i \in [1, N]$ .

According to the World Bank' definition, the poverty gap at \$1.90 a day (2011 PPP) is the mean shortfall in income or consumption from the poverty line \$1.90 a day (counting the nonpoor as having zero shortfalls), expressed as a percentage of the poverty line. This calculation method reflects the depth of poverty and its incidence. The definition of the variables is shown in the below table.

Table. 1. Definition of the variables

Variable symbol	Definition	Unit
Poverty	Poverty gap at \$1.90 a day (2011 PPP)	%
Remittances	Personal remittances, received (% of GDP)	%
External debt	External debt stocks (% of GNI)	%
ODA	Net Official development assistance received (% of GNI)	%
Openness	Calculated by the sum of exports and imports divide by GDP	%

Source: Calculates from the research data (World Bank 2018)

The paper applies two methods including the Ordinary Least Squares (OLS) and the Generalized Method of Moments (GMM) methodology to estimate the equation 1. In order to deeply analysis, the methods will be estimated by some different models and compared with others to have the best result which answering about the exact effects between variables. In the estimation process, there are two main steps.

Firstly, the OLS technique is employed with three models including Pooled model (Pool), Fixed effects model (FEM) and Random effects model (REM). After that, the F-test is used to choose Pooled model or Fixed effects, if the null hypothesis is rejected (the p-value is smaller than 0.05), the testing result confirms that the result of the Pooled result is biased and the Fixed effects is the better one. The Hausman test helps to choose which is the better one between the Fixed effects or the Random effects. If the null hypothesis is rejected (p-value is smaller 0.05), the evidence implies that the Random effects is biased and the Fixed effects is chosen.

Secondly, there is a problem namely the endogenous phenomenon amongst some variables in the estimation progression. This problem leads to violating the assumptions of a good linear regression model. The endogenous phenomenon makes a biased result in the econometric result. In order to solve this problem, we must find the instrumental variables to replace the endogenous variables.

The GMM method is applied to solve the endogeneity in the econometric model, and the result of OLS can be used for comparison. The Fixed effects and the Random effects model continuously use for estimated progress as well as the Hausman test helps to choose which is the better one in the results. Based on the suggestion of Vella and Verbeek (1999), the instrumental variables will replace the endogenous variables in the econometric function by their lag values. The GMM regressions will help the estimated results pass the endogeneity problem in the econometric model. So this regressive result is good evidence in order to make some implications for the policymakers in the future.

### 2.2. The source of data

Our paper uses a dataset which covering 26 countries in the Asia-Pacific region. A secondary data of 29 years from 1980 – 2015 of variables including poverty rate (Poverty), remittance inflow (Rem), external debt (External\_debt), official development assistance (Oda) and trade openness (Openness). Our panel data is collected

from the World Development Indicators database of the World Bank. The list of countries used in the study sample including Armenia, Azerbaijan, Bangladesh, China, Fiji, Indonesia, India, Iran, Jordan, Kazakhstan, Kyrgyz Republic, Lao, Sri Lanka, Maldives, Mongolia, Malaysia, Pakistan, Philippines, Papua New Guinea, West Bank and Gaza, Solomon Islands, Thailand, Tonga, Vietnam, Vanuatu and Yemen. The description of the variables in this research is shown in the below table.

Table 2. The descriptive statistics of variables

Statistic	Poverty	Remittances	External debt	ODA	Openness
Mean	4.252	5.530	49.780	6.479	83.610
Median	1.800	2.423	38.540	2.727	79.430
Maximum	28.100	36.410	384.000	68.570	375.300
Minimum	0.000	0.012	0.238	-0.644	9.105
Std. Dev.	5.750	7.178	42.280	8.716	44.470
Skewness	2.062	1.792	2.548	2.332	1.381
Kurtosis	7.162	5.721	13.680	10.450	8.436
Jarque-Bera	283.300	635.300	4,307.200	2,696.000	1,309.400
Probability	0.000	0.000	0.000	0.000	0.000
Observations	198	753	738	837	845

Source: Calculates from the research data (World Bank 2018)

### 3. Result and discussion

#### 3.1. Correlation analysis

In fact, we can use the correlation matrix as a good way to summarize data, as an input into a more advanced analysis as well as a diagnostic for advanced step. In Table 2, the correlative result amongst variables in the poverty function is clearly shown. The sign in correlation value will tell us what direction the variables move. In detail, a positive correlation result means the two variables go in the same direction. In the other hand, a negative correlation implies these variables move in opposite directions. So there are some interesting issues coming through this correlation analysis. Firstly, the relationship between remittances and poverty has a negative sign (-0.3494) which implies an increase in remittances can make a reduction in the poverty rate. Besides, trade openness has a negative relationship with poverty (-0.3210) which shows that integration can decrease poverty. Based on the correlation analysis, If a country raises trade openness level, it can have a good effect on poverty.

Table 3. Correlation coefficients between the variables

Variable	Poverty	Remittances	External debt	ODA	Openness
Poverty	1.0000				
Remittances	-0.3494	1.0000			
External_debt	0.0533	0.2312	1.0000		
ODA	0.1335	0.2454	0.3921	1.0000	
Openness	-0.3210	0.3509	0.3716	0.2726	1.0000

Source: Calculates from the research data (World Bank 2018)

However, external debt and ODA have a negative relationship with the poverty rate in the countries. It means when external debt and ODA increase, they will make a raising in the poverty level in the Asia-Pacific developing countries. This evidence can have some worries for policymakers in the situation foreign debt and ODA are popular financial tools for supporting the economic growth in this region. Based on the correlative matrix result, the coefficients between independence variable are quite low (the biggest is 0.3921) so we can conclude that the function 1 does not have the multicollinearity problem (This problem leads to a biased result in the econometric regression). The correlation matrix result is really a good step for advanced regression in the next part of the paper.

#### 3.2. Panel regression result

In the first regressive process, the OLS is employed with three quantitative methods including the Pooled, Fixed effects and Random effects. After that, the F-test and Hausman test will help to select the optimal result for the relationships among variables in the function. However, all of the models are in the same direction. The estimated results are represented in the table below.

Table 4. The Ordinary Least Squares (OLS) estimation results

Dependent variable: Poverty			
Variables	Pooled	Fixed_effects	Random_effects
Remittances	-0.2464***	-0.0460	-0.1977***
External_debt	0.0251***	0.0553***	0.0367***
ODA	0.2417***	0.4597***	0.2936***
Openness	-0.0553***	-0.0640**	-0.0527***
Constant	7.7789***	4.6375**	6.2928***
R-squared	0.2618	0.5407	0.2180
Observations	5,882	173	172
F-test	4.0297 [0.0000]		
Hausman test	6.1942 [0.1851]		

Note: \*, \*\*, \*\*\* significant at 10%, 5%, 1%. The P-values are in parentheses below the coefficients.

Source: Calculates from the research data (World Bank 2018)

As the quantitative result, there are some small differences between estimated models. They are in-line with the effect directions (denoted by the same in the coefficient signs). In detail, there is only a difference in the statistical significance level. As described in the estimated strategy, the F-test as 4.0297 (with P-value is 0.0000) implies that the Fixed effects is better than the Pooled result. Besides, the Hausman test is 6.1942 (with P-value is 0.1851) also confirms that the Random effects is better than the Fixed effects model. Moreover, the estimated result has reflected the correlation matrix result which has discussed in the previous part. Totally, these tests conclude that the Random effects result is the best one to describe the effect of international capital inflow variables on the poverty rate in the Asia-Pacific developing countries.

There are some good findings in OLS's estimation. Firstly, the estimated results confirm that both remittances and trade openness have a negative impact on the poverty rate at the statistical significance of 1% level. This evidence reflects an increase in remittances, as well as a raising in trade openness level, will help reduce the poverty rate in the countries. This finding is good evidence to encourage policymakers in promoting international trade amongst economies. Besides, the role of remittances for social development is also clearer because this financial resource helps decrease the poverty rate in host countries. Our result contributes new evidence in the case of the Asia-Pacific region comparing other regions investigated by Combes and Ebeke (2011), Akobeng (2016) or Tsai and Huang (2007). Furthermore, the coefficient value of remittances is much large than trade openness, which shows the important role of remittances in order to reduce poverty in this region.

Secondly, there are some concerns about the effects of external debt and official development assistance variable. In detail, both external debt and ODA have negative impacts on poverty at the statistical significance of 1% level. This quantitative result concludes if the external debt and ODA continuously increase, they will lead to a raising in the poverty level in the region. Our result expands and helps more clarify previous research results of Zaghdoudi and Hakimi (2017) or Cheng *et al.* (2018). This evidence is clear because of high statistical significance. However, the coefficient value of ODA is much large than external debt, which is meaning that the ODA may be a serious problem for poverty in the long run. Our finding is an alarm in the context the official development assistance and external debt are popular tools for supplying the financial funding for government's activities worldwide.

Table 5. The Generalized Method of Moments (GMM) estimation results

Dependent variable: Poverty		
Variables	Fixed_effects	Random_effects
Remittances	-0.0466	-0.1981***
External_debt	0.0573**	0.0371***
ODA	0.4279**	0.2843***
Openness	-0.0649**	-0.0529***
Constant	4.7735**	6.3380***
R-squared	0.5398	0.2134
Observations	170	
Hausman test	5.5189 [0.2381]	

Note: \*, \*\*, \*\*\* significant at 10%, 5%, 1%. The P-values are in parentheses below the coefficients.

Source: Calculates from the research data (World Bank 2018)

Overall, the estimation results by the GMM method are quite similar to the results of OLS estimation in the previous part. In particular, the Hausman testing value is 5.5189 (with P-value is 0.2381) which confirms that the

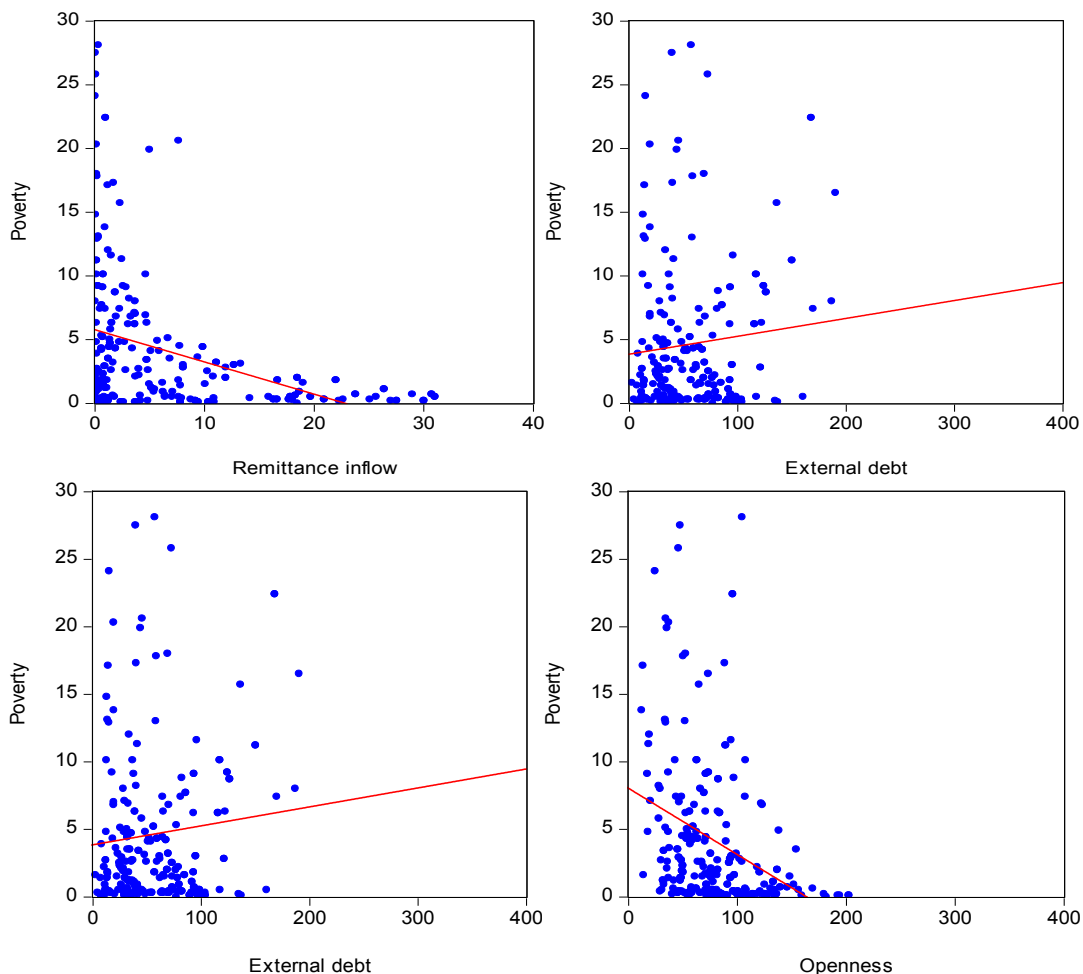
result of the Random effects is better than the Fixed effects in describing the impact of international capital inflows to the poverty rate in the Asia-Pacific developing countries. We exam the endogenous phenomenon by applying some endogenous tests of Arellano-Bond and Sargan. The testing results confirm that the GMM's estimation is free of the endogenous phenomenon. These tests include AR (1) is -1.26 with P-value is 0.209, AR (2) is 0.91 with P-value is 0.365, and Sargan test is 11.19 with P-value is 0.595. Thus, the testing results conclude our GMM's result is no longer endogenous.

The GMM estimation results also show that both remittances and trade openness have positive effects on poverty rate with 1% statistical significance. In addition, external debt and ODA continue to have negative effects on poverty with a statistical significance of 1%. The results also show that the negative impact of ODA is much larger than external debt. The regression results show the multidimensionality of international capital flows for poverty reduction in recipient countries. Our findings are very useful for policymaking progress in reducing poverty in the long term not only in the Asia-Pacific region but also in other regions worldwide.

The results of our study show an alarm about the risks of confusion in the use of external capital for poverty reduction. Normally, international capital inflows are welcome, even countries always try their best to absorb as much external capital as possible. However, our findings note that remittances play a positive role in poverty reduction, however, external debt and ODA are not good for developing countries. Our research results show that developing countries need to be more cautious when using loans or development assistance fundings because these capital inflows can exacerbate poverty in the long term. This evidence is useful in the context of more and more governments abusing foreign debt instruments to reduce poverty, but in fact, these actions exacerbate the poverty of their countries.

In order to further clarify the impact of each independent variable on the dependent variable, some graphs will be presented. In addition, each graph will have a regression line to reflect the impact of each independent variable on poverty rates in the countries in the study sample. The correlation graphs are shown below.

Figure 2. The graphs between poverty and international capital inflows



Source: Calculates from the research data (World Bank 2018)



In these graphs, the horizontal axis is international capital inflow variables while the vertical axis is the poverty rate of the countries. The graphs are closely fitted with the quantitative analysis of the panel regression. The trend lines of the graphs well clarify the impacts of independent variables on the poverty rate in the countries. In detail, the trend lines represent positive effects of remittances as well as trade openness on the poverty rate. Besides, the negative impacts are showed by the trend lines help evidence about the harmful effects or external debt and official development assistance on the poverty rate. The graphs are good proofs for policymakers in order to have a better way for there policies in the context of increasing globalization.

### Conclusion and policy implication

The poverty reduction process is really a long war of mankind. Many countries have been successful in reducing poverty quickly, on the other hand, there are countries stuck in high poverty rates. The successful experiences in poverty reduction in some countries (or regions) are useful information to help other countries with higher poverty rate adjust and operate policies more effectively. Our paper aims to quantitatively analyze the impact of international capital flows on poverty in the Asia-Pacific region, where had many countries with impressive achievements in the past three decades. The research sample is a panel data collected from 26 developing countries in the period of 1980-2015. International capital flows taken into consideration include remittances, external debt, official development assistance, and trade openness (trade openness is also considered as a proxy for international integration). The study result shows some notable findings, in which, international capital flows have two different kinds of impact on poverty in the host countries. In detail, there are only remittances and trade openness have positive impacts on poverty, however, external debt and official development assistance are found to have negative impacts on poverty at the receiving countries. These conclusions are very valuable in studying the factors affecting poverty in developing countries.

Our findings have contributed new evidence to the policymakers in order to reduce poverty not only in the short run but also in the long run. Firstly, countries need to strongly promote remittances as one in the keys to poverty reduction. The solutions should be done to attract more remittance inflow such as modernizing the banking system, improving the money transfer system to have more and more remittances to help reduce poverty. In addition, governments need to support domestic capital sources (such as private investment), thereby limiting the using of international loans as well as official development assistance. Policymakers should note policies to promote domestic resource in order to gradually replace external capital. Finally, the expansion of international trade policy will increase the likelihood of escaping poverty by gaining more income from the exchange of products with foreign countries. Trade expansion is very good to promote the formation and development of the business system and thereby promote the development of the economy. This is a highlighted note for policymakers that international trade is a very important key for poverty reduction in developing countries worldwide.

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## Relationship Between Financial Development and Inflation: Evidence from Indonesia

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### Abstract:

This research examines the relationship between financial development and inflation in Indonesia during the period of 1980 to 2016. In order to do that, it uses autoregressive distributed lag (ARDL) bound test to investigate the existence of long-run cointegration and Wald test to examine both short- and long-run Granger causality. Three different proxies are used to measure financial development; credit to private sector as a percentage of GDP, broad money (M2) as a percentage as GDP, and Financial Development Index. It is found, from empirical results, that long-run cointegration exists between financial development and inflation. It is also found that past value of both variables causes the future value of each other, but through different channels. Lastly, while inflation affects financial development negatively, financial development affects inflation positively.

**Keywords:** financial sector; financial development; inflation; cointegration; causality.

**JEL Classification:** E43; E44.

### Introduction

Indonesia has a huge potential when it comes to financial development. The internet, through its financial technology industry, might help realizing that potential. As reported by the World Bank in the Global Findex Database 2017, Indonesia has become one of developing economies that had a good run from 2011. That is especially because of their record in account ownership data; with 49% of adults population now own a bank account, Indonesia experienced the highest improvement compared to any other countries in the world. Of those who are unbanked, 69% owns a mobile phone, which means financial technology can penetrate those potential with their technology. That method became likely to work successfully as 71% of those who owns an account have made or receive digital payments.

Both variables are important factors for economic growth and income inequality reduction. While studies about the relationship between each element with economic growth are widely available, the discussions regarding the relationship between financial development and inflation are not as much. This study aims to assess the relationship between the two important variables. This study becomes more urgent with the recent boom of financial technology that depend highly on mobile application, as this kind of financial innovation has the potential to boost financial development and disrupt the status quo.

### 1. Research background

The importance of financial development can be reflected by its influence towards economic growth. Financial development affects economic growth by its capabilities in mobilizing savings, distributing capital, exerting corporate control, and relaxing risk management (Greenwood and Smith 1997). Generally, there is a consensus among a line of research that the development of financial sector is crucial to attain sustainable economic growth

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(Levine and Zervos 1996, Singh 2008, Cave *et al.* 2019), although some other prove so only under certain conditions (Ductor and Grechyna 2015). Not only that, financial development has also proven to have a role in reducing inequality (Bittencourt 2011, Ben Naceur and Zhang 2016).

On the other hand, excessive amount of inflation, theoretically, hampers economic growth since it directly affects consumers' purchasing power. A line of empirical findings has found that inflation gives a negative impact towards economic growth, and the effect is more severe on developing economies than on industrialized countries when the number passes a certain level of threshold (Li and Zou 2002, Burdekin *et al.* 2004). Furthermore, there is a wide understanding that the best inflation rates to support sustainable economic growth are the ones that are low enough and stable. Based on empirical studies, the threshold varies widely; for developing economies, it is from 13 to 40% (Bruno and Easterly 1996, Rousseau and Wachtel 2002, Kremer *et al.* 2012).

Both variables are important factors for economic growth and income inequality reduction. While studies about the relationship between each element with economic growth are widely available, the discussions regarding the relationship between financial development and inflation are not as much. This study aims to assess the relationship between the two important variables. This study becomes more urgent with the recent boom of financial technology that depend highly on mobile application, as this kind of financial innovation has the potential to boost financial development and disrupt the status quo.

Given that importance of the two variables, studies regarding the direct impact or relationship between the two are not as abundant as other studies discussing the two with other variables such as economic growth. Study regarding this topic that focus particularly with Indonesia is even unavailable. This study aims to fill that gap by conducting that exactly; especially to firstly see whether long-run relationship exist between the two, and to see which variable is the impacting variable towards the other variable.

There are some questions that this study is aiming to answer. Firstly, whether long-run relationship exist between financial development and inflation rate in Indonesia. Secondly, whether financial development have a significant impact towards inflation rate in Indonesia. And lastly, whether inflation rate have a significant impact towards financial development in Indonesia. And if there exists a significant impact, does it has a positive or negative impact towards its value?

Since this study is trying to examine a two-way relationship, there will be two theoretical foundations that comes with this study. The first one is supported by a theoretical study prepared by Boyd *et al.* (2001), based on Huybens and Smith (1999) and Boyd *et al.* (1996). In that study, Boyd explained that the rise in inflation would mean a shrinking premium of holding any assets, including money or assets in general. A smaller premium means a lower real rate of return. The decrease in this part would reduce the incentive to lend and induce, conversely, the incentive to borrow since now the rate is relatively more affordable. This would invite more demand for credits, especially those of lower quality borrowers, creating a worse credit market friction as the availability of fund is also diminishes.

The previous incidents would mean a worsening credit rationing from financial institutions. They would limit more amount of loans to offered to the market. All of these actions would affect the efficiency of resource allocation and financial market in general because there would be less financial intermediary activities occurring in the market. As a consequence, the financial sector will be shrank and long-run economic performances would be affected.

Meanwhile, there also exists some theoretical frameworks explaining the same relationship but in different direction, that is the impact of financial development on inflation. However, we need to take note that studies exploring this certain direction of relationship are not as abundant as the other direction.

Financial development could affect inflation through a demand-pull inflation phenomenon. Firstly, financial development would induce economic growth, as it is a part of the economic growth equation. This would later affect the aggregate demand of the economy, which usually works in parallel with a more limited aggregate supply in the market. Eventually the general price level would be affected; adjusting to the mentioned dynamics, it would tend to increase. Therefore, creating a higher inflation rate.

Empirical studies discussing both of our main variables are easy to find. However, when it comes to connecting the two, the task becomes more challenging but still very doable. Take Almalki and Batayneh (2015) for the first example, in a study that employed the autoregressive distributed lag (ARDL) testing approach includes trade openness and real gross domestic product as controlling variables, concludes that there was a long-run relationship between financial development and inflation rate in Saudi Arabia for the period of 1982 to 2013. To measure financial development, they use credit to private sector as a percentage of GDP as the proxy. It also shows that there is a statistically-significant negative relationship between the two variables in the long-and-short run.

Most of the studies found that inflation rate is the variable that affects financial development and the interaction only runs in this direction. Boyd *et al.* (2001), for example, found a statistically-significant negative relationship between inflation and both banking sector development and equity market activity. This economically important relationship is also found to be nonlinear; the marginal effect on banking lending activity as well as stock market development is decreasing rapidly as inflation rises. To arrive at this conclusion, this study used three types of regressions; first is simple linear regression to measure the correlation between the two variable, second is one that allows breaks to exist in order to determine existence of threshold, last is one that replaces inflation with its nonlinear transformations to see if they better describe the data. To measure financial development, they used three measurements; liquid liabilities, bank assets, and credit to the private sector.

Zaman *et al.* (2010) explored specifically the impact of financial development on inflation. They examined the evidence from Pakistan within the period year of 1974 to 2007. They do so by firstly testing if there exists a cointegrating relationship between the two using the Johansen approach and ARDL F-bound cointegration test by Pesaran *et al.* (2001). Sequentially, a VAR is constructed and impulse response function (IRFs) are employed to investigate the effects of macro- economic shocks. They measure financial development by three different proxies; bank deposit liabilities, broad money M2, and credit to private sector. From this study, they concluded that there are cointegration between inflation and financial development. Moreover, there exists a unidirectional relationship both in the short and long run between the two variables that flows from inflation to financial development.

Bittencourt (2011), using initially time series then panel time series and panel data and analysis, found that inflation has a harming effect towards financial development through a poor macroeconomic performance. It also concludes that low and stable inflation is a crucial factor for developing an economy's financial sector. To measure financial development, he used several proxies; both money supply M2 and M3, as well as credit to both private sector and general public, all as a percentage of GDP.

Abbey (2012) recognizes several relationships between the two variables. Firstly, they found a negative relationship when running a pair-wise correlation analysis. But a short-run positive relationship was found when running a regression analysis. Other than that, it is also found that there was a unidirectional causal link from inflation rate to financial development.

Katusiime (2018) investigates the effect of inflation volatility on private sector credit growth. It was found, with proven robustness by sensitivity checks, that factors that significantly affects private sector credit growth are previous period of private sector credit growth, nominal exchange rate, as well as inflation rate.

Evidences of economies with the opposite direction, where financial development is the affecting variable towards inflation, does exists but when compared shows a very steep comparison. The number is small but there are some solid evidences proving this relationship with this direction exists.

Tang (2001), for example, explored the determinants of inflation in Malaysia. Using annual data from 1973 to 1997, he conducted a successfully proven long-run cointegration test with Pesaran *et al.* (2001) bound test. By using money supply M3 and bank credit as the measurement for financial development, he found that the following factors were concluded in the determinants of inflation: import price, money supply M3, bank credit, and real income. In addition, Dhakal and Kandil (1993) found that, while not giving a direct impact on inflation, the growth of money stock gave an indirect impact towards inflation through its influence on public's willingness to hold money.

## 2. Methodology

The two main variable in this study would be financial development and inflation. Financial development (FD) is represented by a proxy that is calculated as the amount of credit to private sector as a percentage of gross domestic product (PCG). By using this variable, based on World Bank classification on financial development, this study would focus on the depth of financial development rather than on the access nor the efficiency. Meanwhile, for the other main variable, inflation, this study is using consumer price index (CPI) as a proxy for obvious reason.

However, it is worth noticing that using private credit to GDP ratio as a sole proxy of financial development is a very conventional practice and could be misleading. Many literatures have expressed the importance of proxy choosing for financial development. Adu *et al.* (2013), for example, found that two conflicting results can come from two different proxies of financial development. In the case of Ghana, when using private sector credit to GDP ratio as the proxy of financial development, they found that it has a significantly positive relationship to economic growth. But when broad money supply to GDP ratio is used as the proxy, the relationship become significantly negative.

This study also uses financial development index (FDI) as a proxy of financial development (FD) to deal with that problem. Published in the IMF working papers, this index was formulated by Svirydzhenka (2016) in a mission to deal with the problem of choosing the right proxy of financial development. This index is constructed by developing nine indices that represent how developed one's financial institutions and markets are in terms of their

depth, access, and efficiency, as pictured in the figure below. Those nine indices then gradually aggregated into one overall index, the financial development index (FDI) that is used in this study.

Therefore, this study conducts two tests in order to be able to see the difference between using the conventional private credit to GDP ratio (PCG) and the newly-developed financial development index (FDI).

In addition to PCG and FDI, this study also uses another proxy to measure financial development; broad money M2 to GDP ratio (M2G). This proxy of financial development is particularly used in the second model to see the relationship between our two main variables when financial development is the determinant of inflation.

In addition, this study is using two control variables, similar to a study about the same topic by Almalki and Batayneh (2015), in order to accurately observe our two variables considering the strong relationship these two control variables have with our dependent variable. The first control variable is real gross domestic product (GDP), used to measure the real economy. The other control variable is openness of the economy (OPEN), measured by a proxy: total trade as a percentage of GDP. Trade openness is calculated by summing total exports and total imports, then divided by GDP.

This study obtains its data from the World Bank Database website which provides annual data of each variable, except financial development index, from 1980 to 2016. Meanwhile, for financial development index this study obtains the data from the IMF Database for the same time range. Unless Credit to Private Sector as a percentage to GDP (PCG) and Broad Money M2 as a percentage to GDP (M2G), all data was run in their natural logarithm form. This is to avoid heteroscedasticity when running the data.

This study consists of several tests in order to finally determine the long-run relationship as well as the direction of the relationship. To answer the first research question (examining the existence of long-run relationship between the two variables), this study uses autoregressive distributed lag model (ARDL) suggested by Pesaran (2001). The model is used because of its capability in determining long-run cointegration between two or more series of data without having to make each variable to be stationary in the same order. Meaning, when one variable is stationary at order  $I(0)$ , the other variable could be stationary at order  $I(1)$  and we would still have a valid result. However, no variable can be stationary at order  $I(2)$  in order to have a reliable result. Because we need to make sure that no variable is stationary at order  $I(2)$ , we need to test each variable's stationarity. In order to have a more robust result, this study uses two tests to determine that; Phillip-Perron test and Augmented Dickey-Fuller (ADF) test. Furthermore, this model is also good to use when we have a small number of observations. In fact, previous studies using this model have used even less observations than that that we use in this study, that is 37 series.

Now to answer the other two research questions that focus on the Granger causality of the relationship, this research uses vector error correction model (VECM). By conducting Wald test with this model, we are capable of determining whether one variable is affecting the other variable both in the short and long run. Furthermore, this study conducts those tests in both directions. Therefore, each of our two main variables, financial development and inflation, would act as both the dependent and independent variable once in a time. Below is a graph presenting the framework of this study.

This paper tests the existence of long-run relationship between financial development and inflation rate using autoregressive distributed lag (ARDL) bounds testing approach, as introduced by Pesaran *et al.* (2001). This approach is useful because of its ability in testing the existence of single level relationship between the regressand and the regressor with a simple univariate model. This approach is still applicable even when it is uncertain if the regressors are purely  $I(0)$ , purely  $I(1)$ , or mutually cointegrated. Therefore, such a test, prior to the testing of level relationship, to prove the order of integration is not necessary. To conclude, this approach would not be subject to that type of pre-testing problem that can be found when conducting a typical cointegration analysis.

Following is the ARDL bounds model:

$$\Delta \ln FD_t = \alpha_0 + \alpha_1 \ln FD_{t-1} + \alpha_2 \ln CPI_{t-1} + \alpha_3 \ln GDP_{t-1} + \alpha_4 \ln OPEN_{t-1} + \sum_{i=0}^n \beta_1 \Delta \ln FD_{t-i} + \sum_{i=0}^n \beta_2 \Delta \ln CPI_{t-i} + \sum_{i=0}^n \beta_3 \Delta \ln GDP_{t-i} + \sum_{i=0}^n \beta_4 \Delta \ln OPEN_{t-i} + \mu_t \quad (1)$$

where:  $\Delta$  is the first difference operator,  $\ln FD$  is the natural logarithm of financial development,  $\ln CPI$  is the natural logarithm of consumer price index,  $\ln GDP$  is the natural logarithm of gross domestic product, and  $\ln OPEN$  is the natural logarithm of trade openness.

To see the relationship from another point of view, this study also tests the opposite direction of the same relationship. In order to do that, the same ARDL bound testing approach by Pesaran (2001) is also used. This study uses a model that was used before by Zaman *et al.* (2010) where they examined the impact of financial development towards inflation level in Pakistan. However, there is a little modification due to the unavailability of data in the case of Indonesia.

Following is the model to test the long-run relationship of the opposite direction:

$$\Delta \ln CPI_t = \gamma_0 + \gamma_1 \ln CPI_{t-1} + \gamma_2 M2G_{t-1} + \gamma_3 PC_{t-1} + \sum_{i=0}^n \delta_1 \Delta \ln CPI_{t-i} + \sum_{i=0}^n \delta_2 \Delta M2G_{t-i} + \sum_{i=0}^n \delta_3 \Delta PC_{t-i} + \mu_t \quad (2)$$

where: M2G is broad money supply as a percentage of GDP.

In this test, this study aims to examine the short- and long-run Granger causality between the two main variables, financial development and inflation. The Granger causality test method is chosen over other method because of its ability to show good response regardless of the size of the sample. Therefore, we can eliminate the concern regarding our sample size.

To test that objective, we are going to use the unrestricted error correction version of ARDL model, a method widely popular as the counterpart of ARDL bounds testing approach in determining the long-run and short-run difference of the variables being tested. Working with this method means we need to use two models with each variable tested being the dependent variable on one and another model.

Following is the first model where financial development acts as the variable that was caused or influenced by the inflation rate:

$$\Delta \ln FD_t = \alpha_0 + \sum_{i=0}^n \beta_1 \Delta \ln FD_{t-i} + \sum_{i=0}^n \beta_2 \Delta \ln CPI_{t-i} + ECM_{t-1} + \mu_t \quad (3)$$

where:  $ECM_{(t-1)}$  is the error correction term that will also measure the deviation against its long-run value.

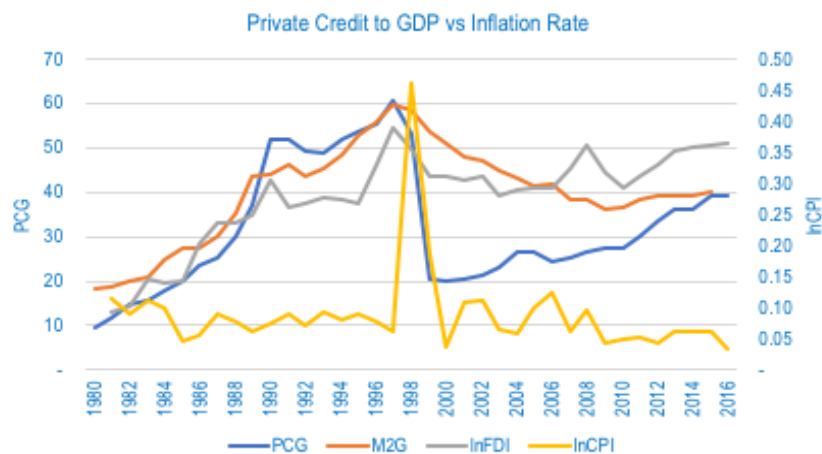
The second model where inflation rate acts as the dependent variable is quoted as follows.

$$\Delta \ln CPI_t = \alpha_0 + \sum_{i=0}^n \beta_1 \Delta \ln CPI_{t-i} + \sum_{i=0}^n \beta_2 \Delta \ln FD_{t-i} + ECM_{t-1} + \mu_t \quad (4)$$

### 3. Case studies

In this section, the authors aim to describe the data that is obtained to run this study. Since there are various variables and proxies of those variables, we can slice this section into two separate pieces; the first one is when financial development is proxied by the ratio of private credit to GDP (PCG), and the other one is when financial development is proxied by financial development index. Both of the parts are discussing the comparison of the data of both variables and discussing the relationship of each movement.

Figure 1. All FD proxies and inflation rate



Source: World Bank and IMF, formulated by author.

Firstly, private credit to GDP (PCG) is used to represent financial development. Figure 1 above is a graph presenting the comparison of movements between the two variables. By seeing the graph briefly, we can say that in overall the two variables are not moving in a very identical pattern. PCG experienced a significant increase on the second half of 1980s, but CPI didn't experience such a drastic movement. Other than that, a visible significant movement of CPI was seen in 1998, when the Asian Financial Crisis occurred. That created a shock in most of economic variables in Indonesia, including our two main variables. In that year, inflation was experiencing a sudden shock, sky-rocketing price indices. On the other hand, financial development was also experiencing a shock, but conversely, dragging down our proxy, private credit, into a significantly lower level. Two years later, both variables were bouncing back to their initial point in the same time together.

Although, when seeing that graph above, we need to keep in mind that that comparison is only able to give us a picture about the direction, not the magnitude of the movement. That is because the author put the CPI indicator in the right-hand axis. He does so in order to present a more presentable figure of every movement of

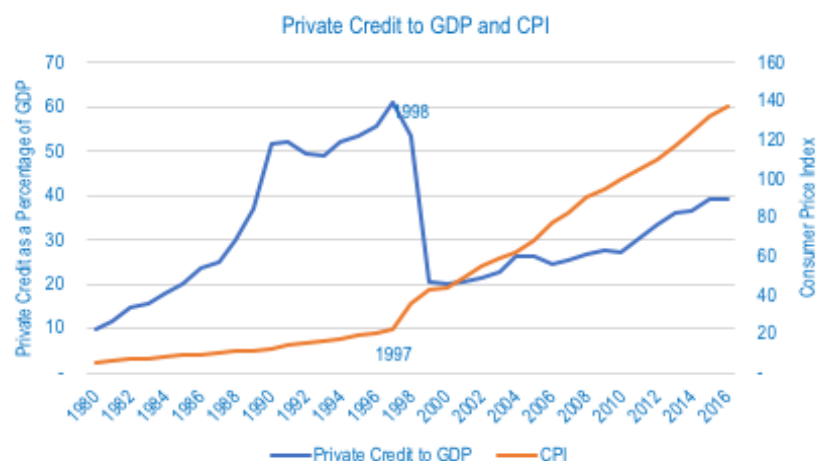
each variables. Putting CPI indicator in the same axis as PCG only reduces the visibility of each of PCG's movement.

Next variable we are going to compare with consumer price index (CPI) is broad money to GDP (M2G). From the graph, we cannot see a visible pattern, as seen as in the previous graph. There are times when the M2G move in the opposite direction as CPI, but in most of the time it moves in the same direction. Sometimes there is also a distinct lag, like one happens between 2006 to 2010. When the Asian Financial Crisis of 1997 happens, M2G didn't experience a sudden change as happens with CPI. This happens because the movement of M2G has been gradual. But afterwards, it experienced a quite notable decrease and has not able to come back to initial value immediately.

Lastly, financial development index (FDI) is used to picture financial development. Above is a graph presenting the comparison of movements between the two variables. Briefly, we can see that it is harder to see a relationship here than before when we do private credit. There are times when the go in the same direction, but some other times they go on the opposite. In 1998 when the Asian Financial Crisis occurred, our significant point before, when CPI was experiencing a sudden increase, FDI was experiencing a drop but not as significant. Also two years later when CPI was already coming back to its initial position, FDI never really come back. From this facts, we can expect to see private credit to have a higher significance when running the cointegration test compared to when we run FDI as the proxy of financial development.

In this section, the author would like to discuss breaks that occur in our data. As mentioned in the previous section, we can have expectation that there are structural breaks that occurs. To have a better look on those breaks, below is a graph picturing the movements of our dependent variables' data.

Figure 2. Private sector credit to GDP and inflation rate



Source: World Bank.

From the figure above, we can tell that there has been a structural break in private credit to GDP in the year 1998. This break occurs just in time with the Asian Financial Crisis that hampered growth of many countries across East and South East Asia, including Indonesia. In that time, Indonesia's credit to the private sector was dragged down significantly, by seeing the graph and also considering Indonesia's GDP is also dropped although only slightly.

On the other hand, CPI does not seem to have a structural break as drastic as the one that private credit has. There seem to be an unusual increase in the same time as private credit's break but slightly different, 1997, but the increase is not as significant. The increase seems to be coming from the same crisis. However, it would also be included in the test below. To test the significance of each year in each variable that we suspect to have a structural break, a Chow breakpoint test on each points would be conducted. The null hypothesis of this test would be that there is no break in the specified breakpoint. Below is the result of the mentioned test.

Table 1. Results of Chow breakpoint test

Dependent Variable	Year	F-Statistic	Prob. F
Private Credit	1998	13.10*	0.00
CPI	1997	17.77*	0.00

Source: Authors calculations.

Note: \*, \*\*, and \*\*\* denote significance at 1%, 5%, and 10% respectively.



From the result of Chow test above, it can be concluded that the breakpoint on 1997 and 1998, that was caused by the Asian Financial Crisis, is significant on each dependent variables. Therefore, we reject null hypothesis and conclude that the structural break exists in both year for each variable respectively.

Stationary (or unit root) test is conducted in this study to determine if our variables are stationary and in which order each of our variables are cointegrated. Although ARDL bound testing approach by Pesaran (2001) allows variables to be cointegrated in order  $I(0)$  and  $I(1)$ , stationary test is still important to examine whether they are cointegrated in order  $I(2)$ . Because if they are, our ARDL bound testing approach would produce an unreliable result. This study uses two tests to carry out that objective; Phillips-Perron test on STATA12 and augmented Dickey-Fuller (ADF) test on EViews10.

From the results of both tests, we can conclude that there are variety as to at what order each variables are stationary. The answer varies between order  $I(0)$  and  $I(1)$ , but the important thing none is stationary at  $I(2)$ . This become important because in the next section, we will estimate an ARDL bound tests. The result of ARDL bound test would become misleading if one of its variables is stationary at  $I(2)$ . Therefore, with this results in hand, we are able to proceed to testing the long-run cointegration with ARDL bound test.

After stationary tests, we examine the existence of long-run cointegration in each model and from each direction through a series of tests. Firstly, we estimate the basic ARDL model that explains the dependent variables of each model. The lag length of each model is selected by Schwarz Information Criterion (SIC) because this method normally produce the smallest number of lags. In the case where the model with lag length selected by SIC is not statistically significant, Akaike Information Criterion (AIC) is replaced to choose the lag length. To proof that the model is not serially correlated, q-statistics correlogram are presented (in the Appendix). Lastly, we test the statistical significance of long-run cointegration for each model by conducting bound test. Moreover, to examine the long-run form and examine the differences, we also estimate the unrestricted error correction regression from each model.

Under this section, we run the long-run cointegration test where financial development acts as the dependent variables. We have two different proxies for this variable; the conventional one that Almalki and Batayneh (2015) also used, private credit-to GDP ratio (PCG), and the newly developed one by the IMF, financial development index (FDI).

It has been proven that all model represented by all the three proxies are statistically significant, although in various level of significance. This means the result is consistent with our theoretical framework that proved that inflation has an impact toward the development of financial sector. This result confirms that in the long run, there is a relationship going on. Also, by this result we can tell that private credit who holds a 1% significance level, has a stronger position in representing financial development in the relationship than financial development index who only holds a 5% significance level, which is also good. In addition, we have yet to prove the direction and the magnitude of the relationship.

Now, we run the long-run cointegration test where inflation rate acts as the dependent variables. To measure financial development, we also have two different proxies just as in the previous section; the conventional one, private credit-to GDP ratio (PCG) and now with money supply M2G as used by Zaman *et al.* (2010), and the newly developed financial development index (FDI) by the IMF.

From the ARDL bound test results, we reject null hypothesis in one proxy because only the F-test statistics of FDI that exceeds the upper bound of 5% significance level. The same case goes for the other proxy (PCG and M2G) but with a higher level of significance level at 1%. Therefore, we can say that long-run cointegration does exist between inflation and financial development from all proxies, financial development index (FDI) and both private credit to GDP (PCG) and broad money M2 to GDP (M2G) put together. In this case, we can confirm our theoretical foundation by Dhakal and Kandil were money supply does have influence towards the inflation rate.

To sum these series of long-run cointegration tests, there are indeed long-run cointegration between financial development and inflation in both directions. The cointegration does exist in every model but. Thus, the empirical results only hold one of the tow of our theoretical frameworks that there exists a long-run relationship between our two main variables. Therefore, when proceeding into the next section that is Granger causality test, we bring all of our proxies to measure financial development.

Now that we have found that long-term cointegration exist between the two variables, the next step is to determine if there is any Granger causality between the variables and how is the direction if there is any Granger causality. We do so by incorporating the lagged error-correction term into our model as described in the previous chapter. Then, we examine the causality by looking into the significance of the coefficient of the lagged error-correction term and also the joint-significance of lagged differences of the explanatory variables by using the Wald test. Below is the result of the mentioned test.

Table 2. Results of Wald Test for Granger Causality

Causal Flow	F-statistic	t-Test on ECM	R2
CPI $\Rightarrow$ PCG	30.56 (0.00)*	-2.21 (0.04)**	0.75
PCG $\Rightarrow$ CPI	1.07 (0.36)	0.99 (0.33)	0.13
CPI $\Rightarrow$ M2G	1.78 (0.19)	-0.80 (0.43)	0.43
M2G $\Rightarrow$ CPI	0.31 (0.74)	-2.64 (0.01)**	0.27
CPI $\Rightarrow$ FDI	0.88 (0.44)	-4.56 (0.00)*	0.49
FDI $\Rightarrow$ CPI	2.27 (0.12)	-1.66 (0.11)	0.21

Source: Authors calculations.

Note: \*, \*\*, and \*\*\* denote significance at 1%, 5%, and 10% respectively.

To sum everything up, we can conclude that there is a bidirectional relationship between financial development and inflation rate. However, the different flow of influence runs through different channels. Inflation rate affects financial development through credit markets, where an increase in consumer price index decreases the amount of credit delivered to the private sector relative to GDP. On the other hand, financial development affects inflation rate through money supply, where an increase in the money supply would increase the price level.

Table 3. Summary of Causality Test

Variables	Causality	General Conclusion
Consumer price index (lnCPI) and the ratio of private credit to GDP (PCG)	There is a distinct unidirectional causal flow from consumer price index to the ratio of private credit to GDP.	The inflation rate Granger-causes the development of financial sector both in the short and long run.
Consumer price index (lnCPI) and the ratio of broad money M2 to GDP (M2G)	There is a distinct long-run, unidirectional causal flow from the ratio of broad money M2 to GDP to consumer price index.	Financial development Granger-causes the inflation rate only in the long run.
Consumer price index (lnCPI) and financial development index (lnFDI)	There is a distinct long-run, unidirectional causal flow from consumer price index to financial development index.	The inflation rate Granger-causes the development of financial sector only in the long run.

Source: Authors calculations.

## Conclusion

Both of the variables has some relationship through various proxies. Previous studies have found the link from financial development to inflation level through an intermediary variable that is money supply. Most of previous empirical studies found that inflation has a bigger influence towards financial development. However, many of those studies are based on a cross sectional studies, thus reducing the unique attributes of each economy.

This study examines the intertemporal causal relationship between financial sector development and the level of inflation in Indonesia. It takes a sample period from 1980 to 2016. It uses the ratio of credit-to-private-sector to GDP, broad money M2 as a percentage of GDP, and financial development index as the proxy of financial development. On the other hand, it uses consumer price index as the proxy of inflation level. The autoregressive distributed lag (ARDL) procedure was used to run the first part of this study, while vector error correction model was used to conduct the following test to measure the causality and direction of relationship.

The empirical result of this study found that there is a bidirectional causal flow from the level of inflation to the development of financial sector. However, it is found that each direction flows through different channels; one through the credit market, the other through the money supply.

Moreover, it is also found that in general a higher inflation level would hamper the development of financial sector. On the other hand, financial development would give a positive impact towards the inflation rate, in the sense that when financial development rises, the inflation rate also rises.

Policy makers would be one of many parties that can make use of the result of this study. Given the indispensable role of financial development, it is worth to conserve the trend of developing financial sector. This paper has proven that inflation has the capability to hamper this goal. Therefore, in order to achieve that goal, it is important to keep an eye to the rate of inflation. Policy makers, especially the central bank, Bank Indonesia, can keep the inflation rate to stay low, which is already one of its main objectives. Continuing current efforts such as the inflation targeting framework (ITF), which has been going on since around 2005), would be an act that is beneficial for the financial sector.

Meanwhile, this study would also be useful academicians. This research only uses three proxies of financial development and they can only cover a small portion of different aspects to measure financial development. As

mentioned in chapter 3, we can measure financial development through different aspects such as its depth, accessibility, efficiency, etc., also through its institutions as well as its markets. The author recommends further research that focus on other aspects of financial development. Therefore, we would have deeper understanding on the nature of Indonesian financial sector, which will allow us to know and act/response accordingly to a certain condition/phenomenon.

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## Impact of Asymmetric Information in Islamic Financial contract: An Empirical Analysis

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### Abstract:

A primary source of asymmetric information arises from banks' uncertainty about borrowers' creditworthiness. This can generate two types of barriers to efficient credit allocation in the loan market: adverse selection in the likelihood of repayment and moral hazard in the riskiness of firms' business decisions, also affecting repayment. This study investigated the consequences of asymmetric information on Islamic financial contracts in the Pakistani market for small and medium enterprise (SME) business lines of credit. Islamic bank's main financial contracts were discussing the two of them which are Istisna and Murabaha. The methods of 'T test' was conducted to ascertain the difference in means of both forms of financing, whereas Multiple Regression Analysis using panel data to assess the relationship of critical variables with Disbursed amount, profit rate, spread, tenor. Data of three years i.e. from 2016 to 2018 of 35 firms, with 105 numbers of observations having Istisna and Murabaha contract, were taken. The results suggested that both the means of Murabaha and Istisna financing are significantly different in major performance indicators, implicating companies that have taken these two financing have performed differently. Secondly, in most of the ratio that mattered like efficiency and profitability, Murabaha based financing have yielded results that are more efficient and better performed as compared to Istisna.

**Keywords:** asymmetric information; Islamic financial contracts Istisna; Murabaha; Islamic bank; Pakistan.

**JEL Classification:** K12; G11; G21; G23; G32.

### Introduction

#### Background to the study

Banking sector serves as the engine of growth for any economy. An economy cannot run without the existence of banking sector as it channelizes the funds from those who have excess to those who have opportunities to deploy those funds in profit generating activities and share the benefits with the owners of the funds. Islamic banking emerged as a practical reality and started functioning in 1970s. Since then it has been growing continuously all over the world. The global market share of Islamic Banking in total Islamic Financial Industry (IFI) is equivalent to USD 1,557.5 billion which represents 76% approx. the Islamic Financial Industry (IFI), which is equivalent to USD 2,050.2 billion. The global IFI, which comprises of Islamic Banking, Islamic Capital Market and Islamic Insurance (Takaful) sector has growth at 8.30%.

Table 1. Breakdown of global IFI by sector

Sectors of IFI	Banking Assets	Sukuk	Islamic Funds	Takaful	Total
Amount in USD billion	1,557.5	399.9	66.7	26.1	2,050.2
Percentage Share of Each Sector	75.98%	19.50%	3.25%	1.27%	100%

Source: Islamic financial services industry stability report (2018)

As depicted in above table banking assets forms the largest part of IFI. The Islamic finance industry has expanded rapidly over the past decade, growing at 10-12% annually. Today, Shariah-compliant financial assets are estimated at roughly US\$2 trillion, covering bank and non-bank financial institutions, capital markets, money markets and insurance ("Takaful"). In many majority Muslim countries, Islamic banking assets have been growing

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faster than conventional banking assets. There has also been a surge of interest in Islamic finance from non-Muslim countries such as the UK, Luxembourg, South Africa, and Hong Kong.

Islamic Banking and finance has emerged as a potential replacement of interest based financial market. The growth is not limited to the Muslim dominated countries but also shown its foot prints non-Muslim countries. The global Islamic banking industry, operating alongside conventional financial institutions, has also weathered several systemic challenges over the past several years (Islamic financial services industry stability report 2018, 87, 88). Major financial markets are discovering solid evidence that Islamic finance has already been mainstreamed within the global financial system – and that it has the potential to help address the challenges of ending extreme poverty and boosting shared prosperity.

In Pakistan, the banking industry is comprised of conventional banking sector and Islamic banking sector with 87.1% and 12.9% share respectively State Bank of Pakistan (2018). Being the second largest country of Muslim population after Indonesia, Pakistan has great potential for growth of Islamic Banking and financial industry.

Islamic finance is equity-based, asset-backed, ethical, sustainable, environmentally- and socially-responsible finance. It promotes risk sharing, connects the financial sector with the real economy, and emphasizes financial inclusion and social welfare.

The following key principles guide Islamic Finance:

- Prohibition of interest on transactions (Riba);
- Financing must be linked to real assets (materiality);
- Engagement in immoral or ethically problematic businesses not allowed (*e.g.*, arms manufacturing or alcohol production);
- Returns must be linked to risks.

Some of the obvious differences between Islamic and conventional banks are the nature of contract on the basis of which financing is being extended to the customer and mandatory Sharia board supervision of all Islamic banking activities including Islamic financing. Islamic banks extend financing on the basis of Sharia compliant mode of contract while conventional banks provide financing on the basis of loan and interest. The other major factor is the Sharia governance by Sharia board of every Islamic Bank and Islamic banking windows.

In Islamic credit model, the customers specify goods to be purchased through contracts with the bank to acquire on customer's accounts, the banks buy good and attains title of ownership from seller, clients take delivery of the product and pay on deferred basis and if the client defaults, the bank cannot reimburse the penalty charges. Elgari (2003). Here, structural difference with regards to financing between Islamic and conventional banks is that Sharia compliant financing contract should be linked to real assets whereas in conventional financing, loan is granted and interest is charged based on creditor's riskiness. Subsequently, those funds are utilized to acquire asset. This means, no asset is involved directly in contract but indirectly as a result of the contract. This would likely to lead to the problems of asymmetric information.

The borrower has better information regarding potential returns and risk associated with investment projects for which financing are done, than the lenders. This information primarily includes borrower real intention of utilizing borrowed funds. Lack of information creates problems in the financial system on two fronts, before the transaction is entered into and after. These problems are referred to adverse selection and moral hazards respectively Stiglitz and Weiss (1981). Adverse Selection occurs before making transaction, when those potential borrowers who are most likely to produce an undesirable outcome-bad credit risk-are the one who most actively seeks out a loan and thus most likely to be selected. Whereas, Moral hazards occurs after making transaction, whereby the borrower might engaged in activities that are undesirable (immoral) from lenders point of view because they make it less likely that loan will be paid. These activities include making investment in highly risky business such as real estate and property markets while taking loans for less risky project.

Moral hazard produces adverse incentives on bank owners to act in way which are contrary to the interest of bank's creditors mainly depositors, by undertaking risky investment strategies, which if unsuccessful would jeopardize the solvency of the bank. Moral hazard on bank owner can become worse by number of factors which may force borrowers to choose investments with higher returns but with lower probabilities of success Stiglitz and Weiss (1981). Similarly, Adverse Selection can also affect the financial soundness of a bank. Higher lending rate and a greater volatility in expected rates of return to borrowers' project can lead to decline in the average quality of the pool of the applicants who are willing to borrow from the bank. The high creditworthy borrowing customers are driven out of the market by higher lending rates. A prudent bank would ration credit in this situation Stiglitz and Weiss (1981).

Reliable collateral may help to mitigate the banks' asymmetric information concerns by ensuring repayment (Bester 1985, Chan and Thakor 1987). To compensate for adverse selection risks, banks may refrain from funding

risky firm. However, in highly competitive markets, banks grossly ignore these two conditions making their cash flows more instable and can potentially lead to higher non-performing loans (NPL)

On the contrary, as Islamic financing contract includes real asset, the problem of asymmetric information (that includes borrower real intention of utilizing borrowed funds pre and post transaction) is resolved as funds can only be utilized in buying assets mentioned in contract. This make their cash flows more stable and less susceptible to have a non-performing financing.

### Problem statement

The presence and consequences of asymmetric information in Islamic banks financing markets are of crucial importance for credit allocation and financial development, which make the contracts some time, void. Asymmetric information arises from banks' uncertainty about borrowers' creditworthiness. It can occur before or after execution of financial contract. Asymmetric information can generate two types of barriers to efficient financing in the Islamic financial /banks market:

- ad-verse selection in the likelihood of repayment;
- and moral hazard in the riskiness of firms' business decisions.

First is the after effect of holding data that is obscure to somewhere around one gathering engaged with the agreement and makes the individual or association who hold the data have favorable position or get any type of advantages, which would have not been gotten if the data was known to all gatherings engaged with the agreement, this type of asymmetric information leads to adverse selection of products or services offered by the firms. Islamic bank faces this situation when asymmetric of information remains unmanaged.

The second sort of asymmetric information is the consequence of exploiting holding explicit data after the agreement has been concurred or worked out. Both type of issues creates the inefficient allocation of financing and become the challenge for the validity of contract. The aim of this study is to examine at what extant gharar will create uncertainty in the Istisna and Mudarba contract.

Islamic banking assets are 12.9% of the whole Pakistani-banking sector. However, by reviewing the historical data it is been revealed that the non-performing financing of Islamic banks in Pakistan is quite low (2.7%) as compared to overall banking sector non-performing loans (7.9%). State Bank of Pakistan (2018)

Following table depicts the comparative level of non-performing financing of Islamic Banking and conventional banking of last nine quarters spanning from June 2016 to June 2018. Moreover, Islamic Banking institutions and conventional banking institutions are working in the same domestic and worldwide macro-economic environment but the non-performing financing portfolio of the two set of banks are different, therefore a need of study is arising to ascertain the factor, which are acting differently for different set of banks *i.e.* Islamic and conventional banks. We need to ascertain what factors are causing non-performing portfolios in Islamic and conventional banks. Moreover, what are the reasons of their disparity? Furthermore, does this disparity depict in performance of firms taking financing.

Table 2. Islamic banking NPF v/s overall banking industry

Non Performing Financings to Financings (Gross)		
Period	Islamic Banking	Overall Banking Industry
18-Jun	2.7	7.9
18-Mar	2.8	8.3
17-Dec	3	8.4
17-Sep	3.5	9.2
17-Jun	3.7	9.3
17-Mar	3.9	9.9
16-Dec	4.1	10.1
16-Sep	4.8	11.3
16-Jun	4.5	11.1

Source: Islamic Banking Bulletin of State Bank of Pakistan, Various Quarterly issues

### Gap analysis

Handel (2011), Lustig (2011), and Starc (2012) found the effects of adverse selection and imperfect competition in US health insurance markets. However, they mainly focused on insurance markets and no similar work was done to measure the consequences of asymmetric information in lending. Few papers provide crude evidence of the problem of information asymmetry. For example, Bofondi and Gobbi (2006) show that new banks entering local

markets perform poorly relative to incumbents, as entrants experience higher default rates and concentration and default rates are positively correlated. Gobbi and Lotti (2004) claim that there is a positive correlation between branching and markets with low proprietary information services.

Few papers explored impact of asymmetric information in Islamic banking. Yousfi (2013) showed that Mudarabah enables to mitigate the moral hazard problem and lead the entrepreneur to provide the first best levels of effort. On the contrary, Musharakah does not solve the moral hazard problem. One explanation could be the fact that the two parties jointly fund the project and that both of them provide non-contractible efforts, which diminish their incentives. Kömrling (2014) also studied the link between the profit and loss sharing base Islamic financial contracts with respect to information asymmetry and shows that Musharkah and Mudarba base financial contract are mostly facing the moral hazard and adverse selection problem, but there is limited research on debt base Islamic financial contracts like Murabah and Istisna. Shatha (2014) also concluded that the profit and loss-sharing contracts are supposed to be vulnerable to any kind of asymmetric information problems, as the financier faces stronger incentives to closely monitor his clients than he would face in a debt like contract.

Despite the fact that there is a dearth of Islamic financial literature focusing on comparative performance of Islamic and conventional banks (see among others Aggrawal and Yousef 2000, Abdul-Majid *et al.* 2010b, Beck *et al.* 2010, Kablan and Yousfi 2012), there is a large gap that is not covered yet. For instance, academic literature does not provide rigorous analysis of the Islamic financial product structure, and what are their role under asymmetric information, and how to deter opportunistic behavior of borrowers

There was one study, Crawford *et al.* (2013) that empirically measured the extent and consequences of asymmetric information in borrowing by regressing different efficiency factors on variables like loan size, tenor, and interest rate of loans. This riskiness influences banks' pricing of loans as higher interest rates attracts a riskier pool of borrowers, increasing aggregate default probabilities. Data on default, loan size, demand, and pricing separately identify the distribution of private riskiness from heterogeneous firm disutility from paying interest. Results suggest evidence of asymmetric information, separately identifying adverse selection and moral hazard. However, these studies were not done in the context of how financing contracts were designed, neither have they carried a comparative analysis for different mode of financing, and the information asymmetry in each. And above all they were not done in environment of a developing country having higher information asymmetries.

Moreover, there was a need to compare conventional and Islamic mode of financing with regards to asymmetric information, as they are designed different and the problem of asymmetric information in Islamic finance is supposed to be reduced by transferring physical position of financed asset. However, as there are many other factors that are different in Islamic and conventional banks, that cannot be held constant, making their performance and profitability comparison un-reliable. These are size of business, their past loan history and their stage in business life cycle. Businesses that are more stable and mature normally have long term credit history with conventional banks thereby reducing many of the problems of asymmetric information such as moral hazards and adverse selection. Islamic banks are relatively new and are facing more information asymmetry. Hence comparing those with conventional banks might not give credible results as we are purely focusing on the problems of asymmetric information that arrived from the way financing contracts were designed. A work around was to compare mode of financing within Islamic bank that doesn't involved new assets being purchased (Istisna) with that in which new assets are purchased (Murabaha). In Istisna financing, the bank order to manufacture some goods to the and then by an agency agreement customer sell those goods to end buyer firms existent asset is purchased by bank and leased or sale back to firm on deferred payment, effectively giving money to firm that can theoretically utilized that in riskier businesses, and because that intention is not known, this information asymmetry would lead to the problems of moral hazard and adverse selection. Whereas in Murabaha, new assets are purchased directly by bank from the third party and after taking physical or constructive possession, it is sold or leased to that firm, affectively not getting money that could be invested somewhere else, but as asset. This will reduce the problem of information asymmetry. Hence, in this way factors discussed above were affectively controlled for.

Moreover, to keep other bank specific factor constant (that are different within Islamic banks), we select customers from a single bank. We selected Meezan bank as it's a largest full fledge Islamic bank in Pakistan. Moreover, Country Pakistan is selected as Islamic banking is relatively new but rapidly growing at the rate of 14%, and new banks seemed to have more information asymmetry of borrowers as compared to old established banks where borrowers have long credit history.

#### Research objective and significance



In this paper, we measure the consequences of asymmetric information in the Pakistani market for small business lines of credit. This riskiness influences banks' pricing of loans as higher interest rates attracts a riskier pool of borrowers, increasing aggregate default probabilities. To measure the distribution of asymmetric firm riskiness, we estimate models of loan size, profit rate on financing, tenor of financing, and default spread.

Following Stiglitz and Weiss (1981), we assume firms seek lines of credit to finance the on-going activities associated with a particular business project, the riskiness of which is private information to the firm. In fact, those firms know the riskiness of their own project, but banks can only observe the average riskiness of their borrowers, conditional on observable firm characteristics. For a given interest rate, firms' expected profits are increasing with risk due to the insurance effect of loans: banks share a portion of the costs of unsuccessful projects. As a result, higher-risk firms are more willing to demand higher-rate loans. This, in turn, influences the profitability and performance of the borrowing firms. As firms invest in risky business due to asymmetric payoffs, their profitability and performance is compromised. Banks credit department filter out these risky firms through their credit rating, collateral and business risk. Financing rates are charged depending on these characteristics. Since they would grant financing for a particular business and in particular conditions, this would make the firm more disciplined, and efficiency thereby increasing their performance. However, there is always a chance that firm invest that money somewhere else ex-post. Since bank is not aware of firm's intention, that information asymmetry would not only increase risk and lowering the profitability of the bank, but also for the firms themselves. For this reason, higher rates for any bank also worsen the risk composition of its accepted loans. This increases its aggregate default rates, lowering its profitability.

In this study, we analyzed two Islamic financial contracts Istisna and Murabah to assess the impact of information asymmetry on borrowers' performance. We employ independent t-test as well as regression and correlation to assess the extent of information asymmetry affecting their performance.

We also did a comparative analysis of these two modes of financing. Four variables were proposed which can affect the Islamic banks financing contracts especially in Murabah and Istisna in the environment of asymmetry information. We investigated separately for both Islamic financial contracts and their impact on asset and liabilities that can affect any firm or complete sector.

This will help identify the main reasons for moral hazard and adverse selection so that the bank will select the techniques to reduce it. This would also help the bank to avoid the impact of asymmetric information while using these two products.

### Research questions

Particularly, the discussion in this study to review the following questions:

- How is the business concept of Islam in the system of financing in Islamic banking helps to tackle the problem of information asymmetry?
- By tackling asymmetric information problem like moral hazards and adverse selection, how it affects the ex post performance of the borrowers.

### 1. Literature review

This section of study examines the previous studies, concepts, methodologies from other researchers. Most of the studies have done on conventional sector to analyses the relationship between the asymmetric information and companies financing and investment decisions. Both in conventional and Islamic financing and investment tools.

Yousfi (2013) showed that Mudarabah enables to mitigate the moral hazard problem and lead the entrepreneur to provide the first best levels of effort. These efforts depend on the level of risk of the project. First, the profit share of the entrepreneur depends closely on the level of risk of the project. Second, the threat to have no payment in case of failure increases the entrepreneur's incentives. On the contrary, Musharakah does not solve the moral hazard problem. One explanation could be the fact that the two parties jointly fund the project and that both of them provide non-contractible efforts which diminish their incentives.

Shatha (2014) concluded that, the majority of the Islamic investments attributed to Murabaha and ignores the other Islamic investment "Istisna". Islamic banks working in Jordan, the majority of the Islamic investments attributed to Murabaha and, Istesna'a percentage are very low, less than 3%. Although comparisons is being done between the both type of contracts which highlight that the profit and loss-sharing contracts are supposed to be vulnerable to any kind of asymmetric information problems, as the financier faces stronger incentives to closely monitor his clients than he would face in a debt like contract.

Aggarwal and Yousef (2000) studied the set of instruments used by Islamic banks to finance projects in Muslim countries given that Islamic Law prohibits the charging of interest. The evidence indicates that the bulk of

the financing operations of Islamic banks do not conform to the principle of profit-and-loss sharing (e.g., equity contracts). Instead, most of the financing is based on the markup principle, and is very debt-like in nature. They also imply that economies characterized by adverse selection and more hazard will be biased towards debt financing.

Abdul-Majid, Saal, Battisti (2010) investigated the efficiency of Islamic and conventional banks in 10 countries that operate Islamic banking for the period 1996–2002. They found that Islamic banking appears to be associated with higher input usage. They also found that Islamic banks are found to have moderately higher returns to scale than conventional banks.

Beck *et al.* (2010) showed that many of the conventional products can be redrafted as Sharia-compliant products, so that the differences are smaller than expected. While Islamic banks seem more cost-effective than conventional banks in a broad cross-country sample, however, conventional banks that operate in countries with a higher market share of Islamic banks are more cost-effective but less stable. There is also consistent evidence of higher capitalization of Islamic banks and this capital cushion plus higher liquidity reserves explained the relatively better performance of Islamic banks during the recent crisis.

Kablan and Yousfi (2012) analyzed Islamic banks efficiency over the period 2001-2008. They found that they were efficient at 78.9%. The level of efficiency could however vary according to regions. Asia displays the highest score with 84.64%. Country like Malaysia and Pakistan implemented reforms in order to allow Islamic banks to better cope with the existing financial system. They also found that Market power and profitability have negative impact on Islamic banks efficiency. Concentration leads to higher costs through slacks and inefficiency. Again other results from robustness checks appear to stress the specificity of Islamic banks, like their first aim for financing rural population

### 1.1. Asymmetric information

Ugo *et al.* (2014) analyzed Asymmetric information in securitization deals is based on a unique dataset comprising a million mortgages. The main finding was that securitized mortgages have a lower default probability than non-securitized ones. Crawford *et al.* (2018) also studied the effects of asymmetric information and imperfect competition in the market for small business lines of credit. They found evidence of adverse selection in the form of a positive correlation between the unobserved determinants of demand for credit and default. While increases in adverse selection increase prices and defaults on average, reducing credit supply, banks' market power can mitigate these negative effects.

Lester *et al.* (2017) show that equilibrium contracts in insurance and credit markets are jointly determined by adverse selection and market power, and that increased competition and reduced informational asymmetries can be detrimental for welfare.

Karlan and Zinman (2009) estimated the presence and importance of hidden information and hidden action problems in a consumer credit market using a new field experiment methodology. They randomized 58,000 direct mail offers to former clients of a major South African lender along three dimensions: (i) an initial "offer interest rate" featured on a direct mail solicitation; (ii) a "contract interest rate" that was revealed only after a borrower agreed to the initial offer rate; and (iii) a dynamic repayment incentive that was also a surprise and extended preferential pricing on future loans to borrowers who remained in good standing. They found strong evidence of moral hazard and weaker evidence of hidden information problems. A rough estimate suggests that perhaps 13% to 21% of default is due to moral hazard.

Jalaluddin and Metwally (1999), showed a positive relationship between the probability of financing through PLS and the business risk. This means that an entrepreneur with a risky project is more willing to enter into a PLS contract rather than an entrepreneur with a lesser risky project. They also found that if the costs of borrowing (through interest) are high, the probability of financing through PLS are higher. In addition, they found negative relationships between the probability of PLS funding and some independent variables.

Safieddine (2009) has done an investigation of the investment accounts of Islamic banks. He applied agency theory to the banks and found that investment account holders expose their money to risks but lack influence on the management. As, Investment accounts of Islamic banks are created through a so called "two-tier Mudarabah" the depositor is therefore exposed to risks associated with the investment decision of the bank, but the bank does not face any risk, because in the Mudarabah contract the supplier of funds is solely liable for losses. If the investment accounts holders' lack influence and monitoring possibilities on the management due to difficulties gathering information, then there is room for agency problems.

Khan (1989) developed a model which is used to compare variable return schemes (VRS, like equity or PLS) with fixed return schemes (FRS, like debt or mark-up). He found that under the assumption of symmetric

information the VRS dominates, because it spreads the risk much better than does FRS. As soon as he relaxes the assumption of symmetric information, the FRS becomes the dominant method of financing. According to Khan (1989) the dominance of FRS under asymmetric information has two reasons. First, lesser monitoring takes place because only a "reported return below the fixed return is suspicious". Second, the FRS allows for lower monitoring costs because it "minimizes information requirements". Because of these two reasons, he concludes that the dominance of the debt contract stems from the asymmetric information problem observed in practice.

Kömling (2014) compared the asymmetric information problem between a debt like contract and an equity like contract. It proved that profit and loss sharing contracts are more beneficial to make the project successful because it minimizes the risk of maximum losses.

Rifki Ismail in another theoretical study, gave the assessment of moral hazard in Murabaha financing which shows the impact of information asymmetric in moral hazard in relation with price risk (which is the volatility of commodity price). The study also shows which steps can be taken when the honest default occurs and when dishonest default occurs. Kaouther Jouaber also showed the asymmetric information impact in the shape of moral hazard in Murabah financing, the study aim was to analyze the price risk in the context of moral hazard, and price was dependent variable to select the customer by bank.

Alsayyed (2010) studied the uses of Commodity Murabaha, and found that Murabaha is clearly the Islamic treasurer's funding product of choice, as it is flexible enough to facilitate many structures for financing, hedging, and currency exchanging

## 2. Methodology

### 2.1. Theoretical framework of study

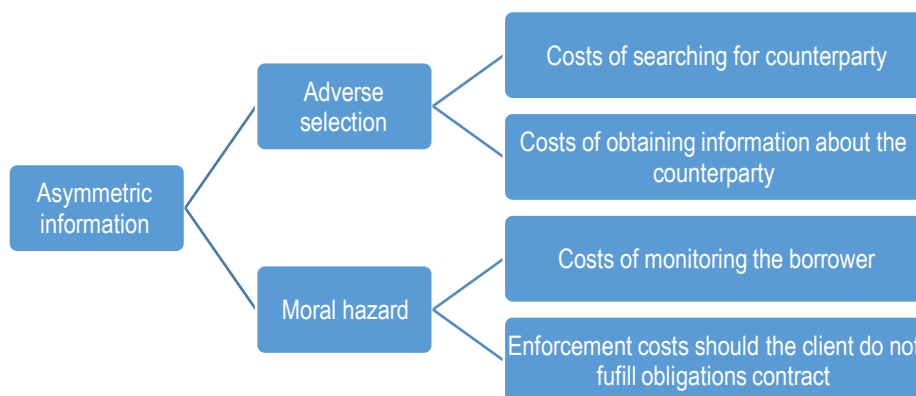
Moral hazard in Islamic based financial contracts can take different forms, which vary according to the type and nature of the contract between the bank and the client. The most common factors triggering moral hazard are:

- the borrower using the funds for different purposes than agreed with the bank;
- the borrower not reporting the profit correctly and truthfully;
- holding inside information used against the interest of the bank.

To tackle the moral hazard problem, the bank needs to regularly monitor the performance of the borrowers by obtaining and screening various types of financial information, such as statement of financial position, profit and loss account, cash flow statement, and statement of change in equity. Banks also send inspectors to firms to monitor borrowers' progress.

Investigating moral hazard leads to additional costs to the bank and the outcome of investigation can be either a success or fail. Where: MC is the monitoring cost. If the moral hazard is detected the bank takes back the remaining value of the asset financed and needs to forgo the mark-up. If the moral hazard is not detected, then the bank bears the monitoring costs and the borrower continuous to retain the asset.

Figure 1. Costs for impact of asymmetric information



Use of incentive can overcome the problem of asymmetric information in Islamic financial contracts. it will encourage the borrowers to provide the critical data of company that save the Islamic financial institutions from moral hazard. In Istisna the industry practice is that bank after purchasing the product from customer appoint him as agent of sale in the market on incentive basis, so this lead to work the customer as an agent smoothly that will safeguard the bank from moral hazard and on the other hand customer don't complete his responsibility his incentive become zero so that bank can cover its share of loss of financing cost.

The risk of adverse selection can be solved by taking security /collateral from the customer, this shows the customer creditworthiness. So bank can cover his repayment risk in Murabaha by disposing off the security. Islamic bank also uses the credit rationing techniques as the conventional do to resolve the issue of adverse selection, after some period of time bank can gather a comprehensive data about the good and bad customer with which prevent him from loss.

## 2.2. Process flow

### 2.2.1. Murabaha

The following process flow serves as the basic Process Flow for Murabaha financing (excluding Spot Murabaha). Any customer willing to avail Murabaha financing must accept this process flow along with the Customer Specific Details and provide acknowledgement on the format attached.). After the necessary Credit and Shariah Approvals, Bank and the customer will enter into MMFA and Agency Agreement for the purchase of goods.

The Bank Representative will educate customer about the Murabaha process and especially about the importance of placing Order Form to Bank before/along with finalizing order with supplier and well before the dispatch of goods from the supplier's premises, signing of Declaration and Murabaha Contract before consumption of goods and storing the purchased stock of goods separately from the stock already present in the warehouse for proper identification.

As an agent, the customer will negotiate the price of the goods in the market for Bank and finalize the details with the suppliers and deliver an Order Form to the bank before/along with finalizing order with supplier (before the dispatch of goods from the supplier's premises).

The disbursement must be done at the time when the customer has to make the payment to the supplier. This implies that in case of Advance Payment, the disbursement will be done at the time of the Order Form. In case of Credit Payments, the disbursement will be done later *i.e.* at the expiry of the supplier's credit period (which is normally after the Declaration and Murabaha Contract). The disbursement will be made to customer's account with bank for onward payment to the Supplier via any approved payment instrument in favor of suppliers. The customer will provide copy of this payment instrument payment evidence to bank for 100 % of the sub Murabaha transactions.

Upon receipt of goods, the customer will declare the goods through Declaration Form in the days mentioned in the Customer Specific Details along with providing the purchase evidences Goods receipt evidence for 100 % of the sub Murabaha transactions.

Simultaneously, customer will give an offer to bank to purchase the goods via Murabaha Contract. It must be ensured by the customer that the goods are not consumed before signing of Declaration Form and Murabaha contract. In case of Partial deliveries, separate Partial Declaration Form and Murabaha contract must be executed immediately for each delivery trench.

To ensure that goods are not consumed before signing of Declaration Form and Murabaha contract, the Bank Representative will also perform random physical inspections of purchased stock in the no. of Sub Murabaha transactions mentioned in the Customer Specific Details and telephonic confirmation report (in case physical inspection is not conducted) will also be enclosed with the declaration form and Murabaha contract.

Upon confirmation, bank will accept the offer by signing the Murabaha contract and the ownership of assets will transfer to the customer. At this stage, the tenor of sub Murabaha, contract price and payment schedule will be finalized through Payment Schedule.

In order to ensure that acceptance of Murabaha Contract is communicated to the customer, the Bank representative must communicate the acceptance of Murabaha Contract to the customer via email/telephone/fax *etc.* immediately on the same day of acceptance of Murabaha Contract. For record and control purposes the Bank's representative must also mention over the Murabaha Contract the date and mode of communication of acceptance along with name of the customer's representative to whom acceptance was communicated. In case of email or fax, a copy of the same may be attached. The customer will settle Sub Murabaha on or before the maturity from its own sources

### 2.2.2. Istisna

The following process flow serves as the basic Process Flow for Istisna financing. Any customer willing to avail Istisna financing must accept this process flow along with the Customer Specific Details and provide acknowledgement on the format attached. After the necessary Credit and Shariah Approvals, Bank and the customer will enter into MIFA and Agency Agreement for the Sale of goods Manufactured by customer.

The Bank Representative will educate customer about the Istisna process and especially about the importance of placing written offer to Bank before/along with finalizing order, signing of Declaration and Istisna Contract before selling the goods in the market on behalf of bank agent.

As a manufacturer, the customer will negotiate the price of the goods with the Bank, finalize the details with the bank, and deliver a Written Offer to the bank before/along with finalizing order. The disbursement must be done at the time when the customer has to make the Written Offer to the Bank. In cases there should be Advance Payment which generates the running for customer. Upon receipt of goods, the customer will declare the goods through GRN (Goods receiving note) in the days mentioned in the Customer Specific Details along with verified quality.

Simultaneously, customer will give an offer from Bank to sell the goods via sale Contract. The customer act as agent with agency fees also customer has given an incentive also which is over and above the bank target selling price. In this price bank can receive it's. In Istisna customer to settle the bank payment on maturity from original proceeds from end buyer, customer is not allowed to repay to from his own resource because it is not the loan transaction but it is sale base sharia mode of financing.

### 2.2.3. Murabaha vs Istisna with respect to moral hazard and adverse selection

Both the Islamic financial contracts have risk of moral hazard and adverse selection but they have difference in stages where both the problems exist, e.g. in Murabaha adverse selection risk exist when customer credit proposal is in approval process if the customer hide some information form Islamic bank which purely the customer have and bank has no direct excess on that information.

For example, after providing proper security to bank for approval of credit proposal and on its behalf customer receive the disbursement for bank and supplier is fake or he has make fake settlement with supplier which is his partner but is not disclose in any document. In this situation in case of disbursement to customer if bank identify this issue of adverse selection bank only can receive its principle amount without profit bank only black list the customer in future but in Istisna also the issue but bank can mitigate this by two ways, one is that the bank can ask the customer to disburse the amount verification of manufactured good if the product received on time bank made payment otherwise bank can apologies to disburse but by this way the Istisna product will not remain viable for industry because its nature is to cooperate with customer to fulfill his running finance needs. In second option bank can ask the customer to if the customer fails to deliver the product at delivery time he is bound to deliver the goods by purchasing from market and also bank can stop the customer factory produced to deliver to any other person and get it delivered to bank itself by force, finally bank has no need to receive the disbursed amount without profit but sometime this is risk in Murabaha.

## 3. Empirical analysis

### 3.1. Data

To attain the objective of this study, a primary annual data from 2016 to 2018 is selected. This data is selected from Meezan Bank of Pakistan's small and medium enterprise (SME) and commercial customers. The number, of observations are 105 from Murabaha customers and 50 observations are from Istisna financing customers. The data is selected on basis of their disbursement, profit rate, tenure, along with balance sheet and income statement figures. Data of above-mentioned financing customers were collected from directly from Meezan Bank record. In data the mean, standard deviation, and probability shows significance level, probability in all is less than 0.5 which consider very efficient in industry.

When we make comparison in both modes of Islamic financing we found that probability of both the financing is have level of significance e in Murabaha the level is very high because all independent variables in relation with dependent variable have probability under the acceptable range but in Istisna probability of dependent variable have negative relation with independent variable but it does not affect the real factor which shows that the Istisna financing on ROE, ICR, FAT does not have any impact

Table 3. Descriptive statistic (Murabaha financing)

	DA	SPRED	PR	TENOR	PM	TAT	EM	FAT	ROA	ICR
Mean	4,868,653	0.022594	0.096346	148.2762	0.209546	5.271286	1.690048	83.51522	0.466732	0.838144
Median	2,000,000	0.0225	0.0868	178	0.0699	3.50137	1.2189	15.76127	0.2241	0.2659
Maximum	25,000,000	0.0565	0.951	270	7.51657	71.40822	7.80021	964.8595	10.1659	10.705
Minimum	125,000	0.01	0.0716	1	0.00271	0.08189	0.16777	0.1108	0.0162	0.0175
Std. Dev.	6,570,561	0.011326	0.084895	62.0977	0.749522	7.606361	1.384871	189.9784	1.091595	2.256208
Skewness	2.020009	0.769974	9.853098	-0.12034	9.009218	6.442254	1.917884	3.324476	7.216809	4.027875
Kurtosis	6.113479	3.37444	99.71429	2.15708	87.78951	55.70852	6.847657	13.60189	61.89783	17.7666
Jarque-Bera	113.817800	10.98845	42,621.19	3.361932	32,873.42	12,880.87	129.1394	685.163	16,088.12	1,237.896
Probability	0	0.00411	0	0.186194	0	0	0	0	0	0
Observations	105	105	105	105	105	105	105	105	105	105

Table 4. Descriptive statistic (Istisna financing)

	DA	SPREAD	PR	TENOR	PM	TAT	EM	FAT	ROA	ICR
Mean	11,337,259	0.020625	0.096258	114.1667	0.094464	3.820821	2.981174	190.9057	0.265353	0.315242
Median	11,292,534	0.0225	0.0938	90	0.0583	2.839515	0.991115	19.61888	0.1969	0.16465
Maximum	29,583,360	0.03	0.1159	180	0.39321	13.11266	64.71127	1939.676	1.4742	2.5346
Minimum	1,160,430	0.01	0.0721	60	0.0001	0.25657	0.15068	1.22244	0.0007	0.0175
Std. Dev.	7,775,263	0.007328	0.012527	47.29089	0.100509	2.861496	10.65358	447.9905	0.285906	0.453498
Skewness	0.816737	-0.24978	-0.03201	0.317256	1.71419	1.250137	5.631386	2.87391	2.580821	3.585734
Kurtosis	3.347564	1.881462	2.319252	1.509492	4.874004	4.402553	33.1287	10.38909	10.61087	17.36472
Jarque-Bera	4.183553	2.251022	0.701275	3.936327	22.89852	12.32779	1551.883	131.4541	126.8519	386.6626
Probability	0.123468	0.324487	0.704239	0.139713	0.000011	0.002104	0	0	0	0
Observations	36	36	36	36	36	36	36	36	36	36

### 3.2. Variables

This section explains the econometric models used for measuring impact of disbursed amount (DA), spread, profit rate (PR) and tenor on various efficiency indicators like Profit Margin (PM), Total assets turnover (TAT), Equity multiplier (EM), Fixed Asset turnover (FAT), Return on Assets (ROA), and interest Coverage Ratio (ICR).

#### 3.2.1. Dependent variables

The process of data selection and collection and issues arising are discussed here. This is followed by an overview explaining the list of variables used in the econometric models. Variables are explained as under.

1. *Disbursed amount*: This measured the amount volume of loan sanctioned to the borrower. This amount is disbursed to a needy customer after approving its credit proposal from business unit, risk, CAD, management office and from sharia Dept;
2. *Spread*: This depicts credit default spread, *i.e.* additional rate charged over and above the risk free rate to compensate for the probability of default, higher the probability of default, higher would be the spread. These percentages vary from customer to customer as well as on basis of amount financed and its tenor;
3. *Profit Rate*: The rate of profit charged by the bank on the financing amount. The profit rate is the percentage of principle amount being financed from a commercial bank to its customer usually it followed by a well-known benchmark like KIBOR, LIBOR *etc.*;
4. *Tenor*: The maturity period of the financing, after this period, the principal become due.

#### 3.2.2. Independent variables

Our main variables consisted of Profit Margin (PM), Total assets turnover (TAT), and Equity multiplier (EM). These three financial ratios are decomposition of Return of Equity (ROE) ratio, and known as DuPont Equation. The DuPont equation in profitability analysis explains the drivers of profitability in detail with three drivers which are asset turnover, financial leverage, and profit margin. Succinctly, the DuPont model enables the analyst to ascertain whether the overall profitability of a firm is:

- emanating from the firm's income minus expenses (profit margin);
- a result of effective and efficient use of organization's asset (ATO);
- stemming from the mix equity and debt employed by the company (capital structure), or any combination of these factors (Turner, Broom, Elliott and Lee 2015).

Each of the factors is briefly explained below:

1. *Margins*: Net income/total revenue. High margins are often associated with organizations that are involved in rendering niche services/products, have stringent control over its cost structure (economies of scales or effective use of assets), and the ones enjoying monopolistic market conditions;
2. *Efficiency*: Asset Turnover Ratio is a metric most commonly used for measuring firm's efficiency by dividing total sales with total assets. It allows the users of financial information to assess how effectively the firms is capitalizing its assets in generating profitability;
3. *Financing Policy*: The third component of DuPont model pertains to measurement of company's financial leverage by means of equity multiplier. It is a financial ratio determined by dividing a company's total asset value by total net equity. Other ratios that depicted performance were also analyzed, these includes;
4. *Fixed Asset Turnover*: It is used by analysts to measure operating performance. This efficiency ratio compares net sales (income statement) to fixed assets (balance sheet) and measures a company's ability to generate net sales from its fixed-asset investments, namely property, plant, and equipment (PP&E). In general, a higher fixed asset turnover ratio indicates that a company has more effectively and efficiently utilized its fixed assets;
5. *Return on assets (ROA)*: is an indicator of how profitable a company is relative to its total assets. ROA gives a manager, investor, or analyst an idea as to how efficient a company's management is at using its assets to generate earnings;
6. *Interest coverage ratio* is a debt ratio and profitability ratio used to determine how easily a company can pay interest on its outstanding debt. The interest coverage ratio may be calculated by dividing a company's earnings before interest and taxes (EBIT) during a given period by the company's interest payments due within the same period. The Interest coverage ratio is also called "times interest earned." Lenders, investors, and creditors often use this formula to determine a company's riskiness relative to its current debt or for future borrowing.

### 3.3. Methodology

We attempted 3 pronged approach for analyzing the problems of moral hazards and adverse selection. At first, we compare the mean and variance of different efficiency and performance measure and performed independent t test to ascertain whether the performance to the two modes of finance statically different.

#### 3.3.1. Performance comparison of the two modes of financing

The first four dependent variables were financing details and subsequent six variables are performance details of three years after financing have being taken. We hypothesized that in Murabaha financing, where problems of asymmetric information is less because of position transfer mechanism discussed above, this will more efficiently be utilized in the business, these funds would not be diverted in other risky sectors that would increase the risk and reduce the performance in long run. In short run, they might benefit from the windfall profit in risk businesses but due to stochastic nature of risky returns, these will cancel off in long run thereby decreasing the performance and efficiency.

Table 5. T-Test: Two-Sample assuming unequal variances

		Mean	Variance	t Stat	P value (two-tail)
Disbursed Amount	Murabaha	4,868,652.95	4.317E+13	-4.473934	4.098E-05
	Tigara/Istisna	11,337,259.25	6.045E+13		
SPREAD	Murabaha	0.022592143	0.0001283	1.1941622	0.2354193
	Tigara/Istisna	0.020625	5.371E-05		
Profit Rate %	Murabaha	0.096345714	0.0072072	0.0102272	0.9918576
	Tigara/Istisna	0.096258333	0.0001569		
Tenor	Murabaha	148.2761905	3856.1249	3.4307706	0.0009599
	Tigara/Istisna	114.1666667	2236.4286		
Profit Margin	Murabaha	0.20954618	0.5617825	1.5336053	0.1278974
	Tigara/Istisna	0.094465318	0.0101018		
Total assets turnover	Murabaha	5.27128662	57.856728	1.6439478	0.1024633
	Tigara/Istisna	3.820820235	8.1881596		
Equity multiplier	Murabaha	1.690048252	1.9178672	-0.725054	0.473239
	Tigara/Istisna	2.98117466	113.49866		
Fixed Asset turnover	Murabaha	83.51521608	36091.792	-1.395906	0.1706391
	Tigara/Istisna	190.9057377	200695.48		
Return on Assets	Murabaha	0.466730561	1.1915714	1.7256025	0.0867241
	Tigara/Istisna	0.265352763	0.0817412		
Interest Coverage Ratio	Murabaha	0.83814381	5.0904723	2.246192	0.0264473
	Tigara/Istisna	0.315241667	0.2056607		

Table 4 showed that the input variables do not depict any significant difference apart from disbursed amount. Especially the profit rate and spread that depict the riskiness of investment didn't seem to differ significantly (p value 0.99, and 0.23). This means that both modes of financing have more or less the same risk level of customers. Despite the fact that on average Murabaha financing has slightly more maturity that is significantly different.

On the other hand, the output variables depict a slightly different picture. Two out of three DuPont measures showed mildly significantly difference among them. With both profit margin and turnover that showed demand and supply side performance and efficiency respectively are on average higher for Murabaha financing. Where Tijara and Istisna is mainly benefiting from leverage however the difference showed insignificant. The other ratios like ROA and interest coverage, also shown better performance for Murabaha financing with higher mean and both significant at 10% and 5% respectively.

This analysis showed two major findings:

- Both the means of Murabaha and Istisna financing are significantly different in major performance indicators, implicating companies that have taken these two financing have performed differently;
- In most of the ratio that mattered like efficiency and profitability, Murabaha based financing have yielded results that are more efficient and better performed as compared to Istisna.



3.4. Correlation analysis

The below two tables showed coefficient of correlation among the variables of Istisna and Murabaha financing. It is evident that a moderate correlation exists between disbursed amount and the profit rate. Spread is also highly correlated with tenor for Istisna financing. Tenor is also moderately linked with the profit rate. This kind of relationship is not evident in case of Murabaha financing. This showed that Istisna more closely behaved with debt security then Murabaha. ROA and profit margins seems to have high correlation as expected, this suggested that main driver for return were demand led growth rather than supply led efficiencies.

Table 6. Correlations (Murabaha financing)

	DA	SPREAD	PR	TENOR	PM	TAT	EM	FAT	ROA	ICR
DA	1									
SPREAD	-0.27472	1								
PR	-0.09311	0.092426	1							
TENOR	-0.01075	-0.0843	0.042247	1						
PM	0.031218	-0.12306	0.009017	0.082282	1					
TAT	-0.08757	0.116757	-0.03406	-0.06473	-0.11296	1				
EM	0.249122	-0.00623	-0.04887	-0.17097	0.131437	-0.27927	1			
FAT	-0.14753	0.001317	-0.04144	-0.07998	-0.08376	0.27007	-0.08386	1		
ROA	0.022575	-0.11195	-0.00483	0.140907	0.92926	-0.00232	-0.00657	-0.06791	1	
ICR	-0.06703	0.081098	-0.00194	-0.15856	-0.05555	-0.02268	-0.04602	0.342279	-0.04688	1

Table 7. Correlations (Istisna financing)

	DA	SPREAD	PR	TENOR	PM	TAT	EM	FAT	ROA	ICR
DA	1									
SPREAD	-0.32479	1								
PR	-0.41417	-0.16076	1							
TENOR	0.010577	-0.80535	0.554143	1						
PM	0.271207	0.121269	-0.31829	-0.30769	1					
TAT	-0.31966	0.068242	0.270035	-0.00617	-0.34183	1				
EM	0.421303	0.030758	-0.11262	-0.07605	-0.13625	-0.23603	1			
FAT	-0.41584	0.388901	-0.05242	-0.2192	-0.21631	0.36147	-0.06091	1		
ROA	-0.01726	0.040757	-0.10336	-0.19104	0.545513	0.342778	-0.17506	-0.03569	1	
ICR	0.132256	-0.00123	-0.37336	-0.01824	0.058583	-0.2204	-0.0145	-0.05885	-0.0884	1

3.5. Regression analysis

We apply multi-regression analysis to analyze the impact of disbursed amount, spread, profit rate, and tenor. We made fourteen models, the first six models were regressed with the total asset, total liabilities, sale, and net profit. In this analysis, we consider total asset, total liabilities, sale, net profit as independent variables and disbursed amount, spread, profit rate as dependent variable. We employ the following regression equation:

$$Y' = \alpha + \beta_1 TA + \beta_2 TL + \beta_3 SALE + \beta_4 NP \tag{1}$$

The rest of the models were regressed in different performance ratios. These included Profit Margin (PM), Total Assets Turnover (TAT), earning multiplier (EM) as a proxy of leverage, Fixed Assets Turnover (FAT) to assess the quality of fixed assets, Return on Assets (ROA), and Interest coverage ratio (ICR). We employ this in the following regression equation:

$$Y' = \alpha + \beta_1 PM + \beta_2 TAT + \beta_3 EM + \beta_4 FAT + \beta_5 ROA + \beta_6 ICR \tag{2}$$

Table 8. Regression equation result

		Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	
		Murabaha	Istisna	Murabaha	Istisna	Murabaha	Istisna	
		Dependent Variable						
Independent Variables	C	DA		SPREAD		PR		
		Coefficient	4868653	11337259	1.326763	0.020625	4.883189	4.563633
		t-Statistic	3.26E+15	1.51E+15	18.01226	7.55E+14	1.21E+15	1.12E+15
	Prob.	0	0	0	0	0	0	
TA	Coefficient	8.48E-14	1.67E-14	-2.02E-07	5.27E-23	2.20E-19	5.36E-21	

		Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	
		Murabaha	Istisna	Murabaha	Istisna	Murabaha	Istisna	
TL	t-Statistic	6.869016	1.179882	-0.33093	1.021551	6.595607	0.699548	
	Prob.	0	0.2534	0.7418	0.3205	0	0.4932	
	Coefficient	-9.07E-14	-1.71E-13	-1.53E-07	-6.67E-22	-1.43E-19	-6.73E-20	
	t-Statistic	-4.81221	-1.52776	-0.16429	-1.6295	-2.81428	-1.10784	
	Prob.	0	0.144	0.87	0.1206	0.0065	0.2825	
	SA LE	Coefficient	-6.97E-15	7.10E-14	-2.15E-07	2.59E-22	2.57E-20	3.68E-20
		t-Statistic	-2.63802	3.38702	-1.6498	3.385334	3.594217	3.239574
		Prob.	0.0105	0.0033	0.1039	0.0033	0.0006	0.0045
	NP	Coefficient	-1.17E-14	0	2.06E-08	-1.75E-22	-2.23E-20	8.98E-20
t-Statistic		-1.19641	0	0.042645	-0.50374	-0.84463	1.736886	
Prob.		0.236	1	0.9661	0.6206	0.4015	0.0995	
R-squared		1	1	0.976313	1	1	1	
Adjusted R-squared		1	1	0.961508	1	1	1	
F-statistic		3.51E+30	1.32E+30	65.94629	8.79E+28	2.27E+29	2.16E+30	
Prob(F-statistic)		0	0	0	0	0	0	
Durbin-Watson stat		3.034791	2.512496	1.515861	2.528205	2.815141	2.240126	

In model 1, Disbursed amount is significantly affected by total assets, where in model 2 (Istisna) it remained insignificant. This showed that in Murabaha financing, more assets lead to more loans as expected, but not for Istisna. This could be because the Istisna have no direct effect on customer assets as in Istisna customer produce the goods and sell to the customer/ultimate buyer.

Similarly, total Liabilities have a more significant effect on Disbursed amount in case of Istisna. This means more borrowing in case of more liability. It could be a sign that company is utilizing additional borrowing so where else. However, it is not the case in Murabaha due injection of payment in real asset as bank try to utilizes the amount in real purchasing.

Total Assets have more pronounced effect in Spreads in model 3 (Murabaha). More asset leads to lesser spread as accepted for Murabaha, but for Istisna, the relationship is inverted. This means that assets quality was not captured in Istisna leading moral hazards. Spread was also seemed to be influenced by total liabilities in Istisna financing (model 4). This clearly showed, more liability, leads to more spread for Murabaha, but not for Istisna this mean information is not properly absorbed in spreads for the case of Istisna.

Similar to spreads and total assets, the profit rate was also significantly influenced in Assets in case of Murabaha, this indicated increase in assets followed by riskier financing. Similarly, liabilities also have a significant effect in profit rate as in spread. Means risky investment were charged more in case on Murabaha, lowering the problems in information asymmetry. The factors in Istisna remained insignificant.

In model 7 (Table 8), Profit margin had a strong and significant impact on disbursed amount for Murabaha financing as compared to Istisna. This means, in case of Murabaha, higher profits are better captured by banks, and disbursed amount are better utilized. The reason is that, in Islamic financial contracts, banks focus on sale contract for customer financing. Whereas, disbursed amount were not seemed to be effected from quality of fixed assets for both model 7 and 8. Disbursed amount was also affected by financial leverage for model 7 (Murabah). This showed higher disbursement, leads to increase leverage effect, this would ultimately be increasing riskiness of ROE, whereas that relationship is not significant in Istisna. Similarly, in model 7 and 8, quality of fixed assets didn't seem to effect the disbursed amount in both the cases.

Table 9. Regression equation result

		Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	
		Murabah	Istisna	Murabah	Istisna	Murabah	Istisna	Murabah	Istisna	
		Dependent Variable								
		DA		SPREAD		PR		TENOR		
Independent Variables	C	Coefficient	4868653	11337259	0.022594	0.020625	0.097613	0.096258	147.6912	114.1667
		t-Statistic	8.68E+14	2.06E+15	5.48E+14	2.38E+15	4.20E+00	4.16E+15	27.96855	9.38E+14
		Prob.	0	0	0	0	0.0001	0	0	0
	PM	Coefficient	4.92E-08	1.26E-08	2.76E-16	1.90E-16	-1.57E-03	-5.24E-16	-2.507764	-2.04E-12
		t-Statistic	4.421539	0.3378	3.372805	3.242665	-0.03404	-3.35607	-0.239335	-2.4852
		Prob.	0	0.7399	0.0013	0.0051	0.973	0.004	0.8116	0.0244
	TAT	Coefficient	-5.73E-10	2.06E-09	-7.94E-19	3.32E-18	-3.23E-04	-1.12E-17	-0.278474	-1.15E-14
		t-Statistic	-1.41543	1.806613	-0.26658	1.84579	-0.19212	-2.33601	-0.730447	-0.45658
		Prob.	0.1619	0.0897	0.7907	0.0835	0.8483	0.0328	0.4679	0.6541
	EM	Coefficient	-1.72E-08	9.48E-11	-1.38E-16	6.71E-19	-9.84E-04	-2.59E-18	0.784259	-5.46E-15

		Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	
		t-Statistic	-6.62061	0.401951	-7.22397	1.805494	-0.09137	-2.6208	0.320848	-1.04933
		Prob.	0	0.693	0	0.0898	0.9275	0.0185	0.7494	0.3096
	FAT	Coefficient	3.22E-11	1.77E-11	9.01E-20	-4.45E-20	1.35E-05	4.76E-20	0.000389	4.65E-16
		t-Statistic	1.387443	1.697593	0.528691	-2.71063	0.140065	1.088375	0.017831	2.020786
		Prob.	0.1703	0.1089	0.5989	0.0154	0.8891	0.2926	0.9858	0.0604
	ROA	Coefficient	-3.50E-08	-3.96E-10	-2.00E-16	-4.85E-17	2.13E-03	1.93E-16	2.865672	7.85E-13
		t-Statistic	-4.60894	-0.03227	-3.57496	-2.51129	0.06753	3.755108	0.400819	2.899575
		Prob.	0	0.9747	0.0007	0.0231	0.9464	0.0017	0.6899	0.0105
	ICR	Coefficient	-8.33E-10	1.02E-08	1.55E-18	6.31E-18	3.68E-04	0	-0.139678	1.55E-13
		t-Statistic	-0.66846	2.291651	0.16934	0.903412	0.071191	0	-0.119114	1.58471
		Prob.	0.5063	0.0358	0.8661	0.3797	0.9435	1	0.9056	0.1326
	Adjusted R-squared		1	1	1	1	-0.06035	1	0.897888	1
Prob(F-statistic)		0	0	0	0	0.696332	0	0.00	0	
Durbin-Watson stat		2.773731	2.046115	2.793367	2.317264	4.434157	2.275504	4.400719	1.9269	

Note: Periods included: 3 (2016-2018); Companies included: 35 for Murabaha, and 12 for Tijara and Istasnah; Total panel observations: 105 for Murabaha, and 36 for Tijara and Istasnah; Effects Specification: 1. Cross-section fixed (dummy variables) 2. Period fixed (dummy variables).

The effect of return on asset (ROA) on dispersed amount was highly significant for Murabaha, whereas insignificant for Istisna. This showed borrowing are affectively utilized in Murabaha as compared to Istisna, the reason behind is that in Murabaha customer purchases the goods from bank at the market rate. That variation in prices produced more effect on return on equity (ROE). However, customer cannot have capitalized on higher market rate as in Istisna, because customer sell the goods to bank, and now bank can set the price that would not necessarily depicted in market. High significance of interest coverage ratio on disbursed amount in model 7 showed Istisna business have more safely covered from default risk.

In model 9 and 10, different performance variables were regressed on default spreads. Profit margin have highly significant effect on default spread, for both cases, this showed risky projects were effectively captured by the bank in higher spreads. Similarly, financial risk due to leverage was also captured adequately in default spreads in case of Murabaha. Higher spread also leads to lower total assets turnover in model 9, according to expectations, whereas the relationship is inverse and significant to Istisna (model 10). This could mean, in Istisna, fund was invested in those areas where risk was not captured by the bank, evidence of asymmetric information. Similarly, spreads are also being influenced by financial leverage (EM) for Istisna but the effect remained insignificant at 5%, showing information asymmetries not fully captured by the bank. In model 9 (murabah), fixed asset turnover, had a strong and significant effect on default spreads. This indicated that better fixed assets utilization increase their turnover at a higher spread. This means riskier business are utilizing funds efficiently, however it remained insignificant for Istisna case. This relationship is also valid to Return on assets, as both is significantly influencing the spreads.

In model 11 and 12, financing rates were negatively affected by profit margin for both forms, indicating risky investments seems to have lower profitability, the effect is however insignificant for Murabaha maybe because of better utilization of financing. The same effect is witnessed for total assets turnover.

Financial leverage also negatively affected that financing rate as in case with spreads. The effect is significant for Istisna (model 12).

Return on assets was also positively related to financing rates for both forms however, the effect is significant for Istisna (model 12). It showed that higher financing rate leads to higher returns afterwards, It could mean, in case of Istisna, that banks were funding business that were more cyclical in nature, whereas in Murabaha financing, funds were invested in core activities that didn't significantly move with the rates.

In model 13 and 14, profit margins had inverse effect on tenor, the effect is significant for Istisna. This showed that long term projects yield more profit as compared to short term, however the effect was not significant for Murabaha. Similar result was found with Fixed assets turnover and Return on Assets, as it positively and significantly affected the tenor for Istisna (model 14), indicating more efficiencies in longer run, however it remained insignificant for Murabaha. At last, interest coverage ratio largely remained in significant in all models.

## Conclusion

Asymmetric information topic has widely discussed in relation with conventional banks. Some studies have been done on asymmetric information in relation with Islamic financial contracts as it discussed in literature review but majority studies are on equity base Islamic financial contracts like Musharkah and mudarba with respect to both aspect adverse selection and moral hazard, the studies show that both problem exist in Musharkah and Mudarbah

and has been discussed their solution. There is another type of Islamic financial contract which is consider on debt base *i.e* Murabaha, Istisna few article is on one side of effect of asymmetric information as moral hazard in Murabaha but no study found on Istisna in connection with moral hazard and adverse selection.

This study not only focused on Murabaha but also compared it with Istisna, It proved that Murabaha also have the problems of adverse selection in a way that at time of selection of a customer a bank may make mistake in credit worthiness checking of client, however, it can be cover by taking security. In Istisna it can be covered by not making disbursement till time of delivery of final product to the bank although as per sharia disbursement to customer is allowed before the delivery as well as at time of making Istisna order, but practically if the Islamic banks restrict the disbursement till delivery the product will not remain viable for market because the customer needs financing for purchasing the raw material, although it is risky which leads to moral hazard.

We selected three years' annual data of 35 customers with the 105 number of observation of Islamic bank, which are utilizing many sharia compliant financing facilities, but I select two: Istisna and Murabaha financing products in different commodities like cotton bales, fertilizer, pesticide, oil cake, rice, wheat seed, cotton seed, chipboard, fans, auto parts, canola seed and medicines. We found no payment delay in all customer which are from very different segments unlike in case of conventional financing, where this ratio relatively high. In Islamic financing contract, the disbursement amount actually placed in asset which has its monetary value so in case of any loss due to availability of actual asset customer can recover major portion of his disbursed amount and will be able to pay the bank financing at the time of maturity, but in the conventional bank, the disbursed amount did not inject directly in physical asset so at time of repayment if customer has not got enough, liquidity he would default. This leads to the problem moral hazard ultimately. Hence, the injection of disbursed amount in real asset is more beneficial for economy.

### Recommendations

The study suggested that SME and Commercial sector to finance their projects under the Islamic financial contracts. It is more secure and disciplined way for both the sectors. Benefit of using these contracts is firstly to avoid interest-based transactions, also these contact does not create the bubble in economy, which can burst at any time.

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## Contribution of Intellectual Capital Strategic Readiness and Government Innovation in Strengthening the Effect of High-Performance Work System Toward Local Government Performance

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### Abstract:

The purpose of this study was to determine the effect of high-performance work systems on the performance of government administration, which mediated by the strategic readiness of human capital and government innovation capabilities. This research conducted in Aceh province, which covers 23 regencies/cities. The sample size in this study was 320 government employees. The sampling technique based on the Stratified Random Sampling technique. The data obtained analyzed qualitatively by quantitative grooming with Structural Equation Modeling (SEM) and Confirmatory Factor Analysis (CFA) methods. The results showed that there was a significant effect between the high-performance work system on the performance of governance and the strategic readiness of human capital. The study also found the role of strategic human capital readiness in mediating the effect of high-performance work systems on the performance of government administration partially.

**Keywords:** performance; intellectual capital; government innovation; governance performance; government; Aceh.

**JEL Classification:** H11; O34.

### Introduction

The Aceh Government currently faced with the problem of the weak process of drafting the Aceh Budget for Income and Expenditure APBA (Anggaran Pendapatan Belanja Aceh), which characterized by two conditions, that is: the inaccurate timing, and the ineffectiveness of APBA in answering various development issues. Within 10 years, starting from 2008 to 2017, the Aceh Government experienced had delayed in ratifying the Aceh Budget for Income and Expenditure APBA, except for 2014, which was determined in December 2013 (one year). The APBA delay that always occurs every year causes the delay in the implementation of development programs, most of which funding comes from APBA. Because of this delay, the quality of public services provided by the Aceh Government to the community has not been optimal. The delay in APBA ratification also has an impact on the weakening of Aceh's economic movements and the failure to achieve economic growth targets and other development targets that have been set.

In general, Aceh's economy still driven by government funding, while the contribution of the private sector is still very low. Therefore, if the APBA determination delayed, then hamper the flow of funds from the government sector until the current budget is determined. This delay has an effect on the slowing down of the flow of money, which in turn can cause sluggish economic transactions and economic growth. Andika Novta ([www.kamuskeuangaeraah.com](http://www.kamuskeuangaeraah.com)) said that two things generally caused the APBA delay, that is:

- the failure of the planning system in accommodating political transactions;
- the failure of the government in laying out a comprehensive regulatory framework and synergistically driving an integrated and efficient planning and budgeting process.

Table 1. Data on APBA for 2008-2017

No	Budget year	Approval Date	APBA Total (Rp)
1	2008	24 Jun 2008	8.518.740.595.768,-
2	2009	29 January 2009	9.791.344.121.604,-
3	2010	19 March 2010	8.246.384.494.167,-
4	2011	15 April 2011	7.974.772.200.000,-
5	2012	31 January 2012	9.711.938.653.801,-
6	2013	20 February 2013	11.304.334.440.412,-
7	2014	28 December 2013	12.939.644.749.248,-
8	2015	31 January 2015	12.735.643.725.149,-
9	2016	22 February 2016	12.874.631.946.619,-
10	2017	31 January 2017	14.733.699.981.655,-

Source: Bappeda Aceh (2018)

In the national development planning system as contained in Law No. 25 of 2004, the planning process consists of four types of processes, namely; technocratic, participatory, bottom up and top down and political processes. Each process can stand-alone or run simultaneously in accordance with the mechanism regulated by legislation. The problem of slow setting and low quality of APBD/APBA/APBK indicated because of various complex problems. Basri and Nabihah (2014). Stated that the delay in the determination and implementation of the APBA was caused by the lack of commitment of the parties in fulfilling the time set according to legislation, lack of sense of responsibility for budget management, lack of consistency between planning, budgeting and implementation, intervention from other parties, and the lack of capacity and capability of government employees. In order to create a quality process, planning and budgeting must integrate so that there are consistency and synchronization across sectors, across programs, and across actors. Without going through an integrated process, the Aceh Work Unit (SKPA) tends to ignore the prepared planning documents and precisely proposes incidental activities as desired, which ultimately have an impact on budget efficiency and the effectiveness of development programs/ activities. This is due to the absence of an integrated and Information Technology based planning and budgeting system.

The management of government in the context of regional autonomy requires local governments to mobilize various resources, both financial resources, human resources and other resources, as well as improving governance (government governance) because the central government has transferred almost one third of its financial resources and two third of the apparatus resources to local governments (Maher and Bedawy 2014). Regional development planning currently only concentrates on financial resources and has not made human resources a strategic pillar to achieve its vision and mission. In fact, to produce a quality and effective development plan, local governments not only need human resources who are able to work hard, but also those who can work smartly, reliably, and professionally so that they can produce mature and systematic planning and can provide welfare impacts optimal and sustainable (Tuasikal 2013). Changing the perspective of Human Resource Management from a function perspective to a strategic perspective requires a change in the management of Human Resources. Because their roles and functions related to the success of development programs, the resources of this government apparatus need to manage properly so they can produce high productivity. Regional leaders need to ensure that human resource management carried out effectively to make optimal contributions to the development of the region.

The importance of human capital in development has been raised by (Aspinall, McCawley and Staff 2012) in its report stating that in the next 5 years, 10 years and even 20 years, the Aceh Government needs a comprehensive Human Resource Management strategic plan in the dimension of public sector reform. This indicates that human resources, especially government employees, are serious problems that must be resolved immediately because they have an impact on the quality of public services so that they have an impact on achieving their vision and mission.

## 1. Research overview

### 1.1. Performance of government management

Organizational Performance Measurement can do using various tools and assessment methods. Kaplan and Norton (Kaplan, Norton, and Davenport 2004) states that a company to achieve its strategic goals so that not only depends on the financial aspects but also must pay attention to non-financial aspects. Kaplan and Norton introduced the Balanced Scorecard (BSC), which divides performance into two dimensions, namely financial and non-financial dimensions. The non-financial dimension consists of three perspectives, namely customer perspective, internal procedure perspective, and learning and growth perspective (Rasula, Vuksic and Stemberger 2012, 147-168).

Long before that, the concept of the High-Performance Organization (HPO) began to known more than fifty years ago (de Waal and Sultan 2012, 213–223): HPO described as a high-performance organization in various aspects. The adoption of the HPO concept in the public sector began when the concept of Reinventing Government was introduced (de Waal and Sultan 2012, 213–223), New Public Management and began to be applied in the Middle East (de Waal and Sultan 2012, 213–223; Pollitt 2003). Meanwhile, performance measurement can also done by using the Criteria for Performance Excellence, which consists of seven criteria, namely: Leadership, Strategic Planning, Customer Focus, Measurement, Analysis, and Knowledge Management, Workforce Focus, Operations Focus, and Results.

In a government system in Indonesia, Local Government Performance measured by using various measuring instruments. Based on the Minister of Home Affairs Regulation No. 73 of 2009 concerning the Implementation Procedure for Evaluating the Implementation of Regional Government, the Performance of Regional Governments measured by the Evaluation of the Implementation of Regional Government. Regional Government Performance defined as an achievement on the implementation of regional government affairs measured by inputs, processes, outputs, results, benefits, and/ or impacts.

The measurement of the performance of government administration in question is through a systematic process of collecting and analyzing data on the performance of the implementation of regional government, the ability to carry out regional autonomy, and the completeness of aspects of the administration of government in newly formed regions. Measurement of Regional Government Performance in Indonesia is based on 3 dimensions, that is: Policy Dimensions, Implementation Dimensions, and Output Dimensions (Field Reality).

### 1.2. High-performance work system

High-Performance Work System (HPWS) is an interesting topic in the management of organizations, both private and public, because of its considerable contribution to maximizing organizational performance (Garg and Punia 2017, 320–337) HPWS is a culture that must developed within the organization by synergizing structural functions and staff functions and optimizing all organizational resources. HPWS also referred to as the core of HR Practices, as mentioned by (Wang and Chen 2013, 861–879) that HPWS is "a set of separate but interrelated human resource practices that are designed to attract, retain and motivate employees".

While previously, Appelbaum *et al.* (Appelbaum, Bailey, Berg, Kalleberg 2000) defines HPWS as a series of various human resource management practices that can facilitate employee involvement, improve skills, and strengthen employee motivation (Özçelik, Aybas and Uyargil 2016, 332–341). Another opinion expressed by (Tomer 2007, 176–189) which states that HPWS is a framework of thinking how to create an organization based on employee involvement, commitment, and empowerment (Ingvaldsen, Johansen and Aarlott 2014, 294–306).

HPWS significantly influences the intellectual capital components as strategic Readiness and divided into 3 main sections, Human Capital, Information Capital, and Organizational Capital. Na Fu, *et al.* (Fu, Flood, Bosak, Morris and O'Regan 2015, 209–231) stated that previous research found that HPWS had an effective impact on organizational financial outcomes (Guthrie 2001, 27–41; Huselid 1995, 635–672) retention (Johnson and Greening 1999, 564–576) productivity (Guthrie 2001, 27–41) efficiency and flexibility (Evans and Davis 2005, 758–775) and employee commitment (Youndt, Snell, Dean Jr. and Lepak 1996, 836–866). In a study conducted by (Wang and Chen 2013, 861–879). Intellectual Capital became a media relationship between HPWS and performance firms. HPWS is considered able to contribute positively to improve organizational performance through improving employee performance, which can be done in 3 ways, namely; increasing employee capacity, increasing employee motivation, and providing opportunities to increase employee potential (Boxall and Purcell 2003, 2011). The main point of HPWS is how to manage and shape human capital within the organization so that it can contribute to the success of the organization.



### 1.3. Intellectual capital strategic readiness

Intellectual capital actually contributes to influencing organizational performance, by optimizing all the resources they have. This is stated by Riahi-Belkaoui (2003) in Nkundabanyanga (2016, 20–45) that according to Resource-Based View, the diversity of organizational performance is the result of the utilization of rich and diverse intellectual capital owned by the organization (Brouthers and Werner 2008, 936–960). This makes intellectual capital a strategic asset because it can affect organizational performance.

Many previous researchers have carried out research on the relationship between intellectual capital, innovation capability, and organizational performance. The empirical study conducted found that the intellectual capital components had a positive and significant relationship to innovation capability and organizational performance (Khalique, Shaari, Abdul, Isa and Samad 2013, 9) Intellectual capital positively affects innovation capability, and, thus, leads to higher performance, which is in line with other researchers, that organizations increasingly need to develop their innovation capabilities beyond technical innovation.

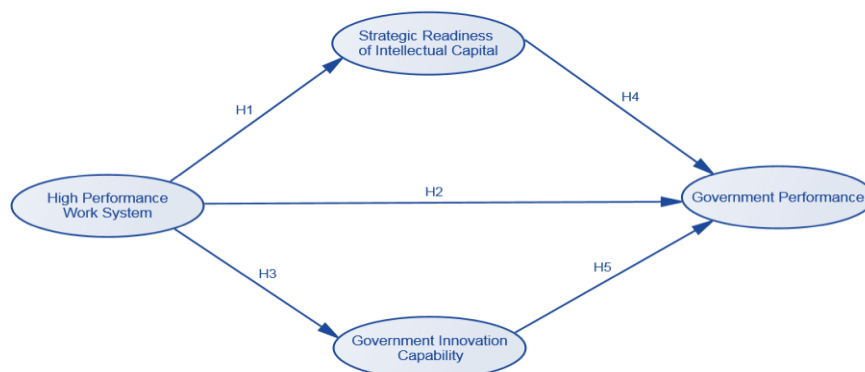
### 1.4. Government innovation ability

The use of the word capability to demonstrate the ability to manage various key organizational capabilities and resources that can stimulate the success of innovation activities. Innovation defined as the adoption of a device, system, service, program, process, product, or service environment that is not necessarily new to that adopting organization (Kocoglu, Imamoglu and Ince 2011, 72–88). Then stated "Innovation capability is as the ability to create new and useful knowledge based on previous knowledge". Furthermore, it is also said, "The innovation capability is a comprehensive set of characteristics that facilitate and support innovation strategies". It is widely accepted that an organization's capability to innovate closely tied to its intellectual capital, or its ability to utilize its knowledge resources (Kalkan, Bozkurt and Arman 2014, 700–707).

### 1.5. Conceptual framework and hypothesis

To achieve the objectives of this study, we build a framework with High-Performance Work System variables as exogenous variables that will affect the Intellectual Capital Strategic Readiness and Government Management Performance. Intellectual Capital Strategic Readiness variable in this model also acts as a mediating variable. Each variable used in this study has dimensions that will explain each variable.

Figure 1. Conceptual framework



Based on the conceptual framework above, the hypotheses in this study are:

H1: High-Performance Work Systems Influence Government Performance;

H2: High-Performance Work Systems Influence Strategic Capital Intellectual Readiness;

H3: Strategic Capital Intellectual Readiness has an effect on Government Performance;

H4: Strategic Capital Intellectual Readiness mediates the effect of High-Performance Work Systems on Government Management Performance.

## 2. Methodology

### Research design

This research carried out at the level of the Provincial and District Governments. The location of this study is the Province of Aceh, which clouds: Aceh Government residing in Banda Aceh and Government of 23 districts/cities

domiciled in each regency/ cities in Aceh. The selection of respondents in this study conducted using a probability sampling approach, specifically the Stratified Random Sampling technique. So that there was a sample of 320 civil servants.

### Instrument and data analysis

Based on the purpose of this study, the data analysis instrument used in this study is quantitative-descriptive analysis using the SEM (Structural Equation Modeling) method with AMOS and SPSS programs. The data analysis phase carried out by testing the SEM assumptions consisting of outlier tests and normality tests. Furthermore, it will also be analyzed the influence of the role of mediation or indirect influence by using Sobel test.

## 3. Study results

### 3.1. Respondents' characteristics

The characteristics of the research object are the results obtained through the questionnaire. Obtained through a questionnaire. The results obtained from the distribution of questionnaires show in Table 2.

Table 2. Respondents characteristic

Description	Numbers	Percentage
<b>Gender</b>		
Male	222	69,38%
Female	98	30,62%
<i>Total</i>	320	100,00%
<b>Rank</b>		
Gol IV	76	23,75%
Gol III	242	75,63%
Gol II	2	0,62%
<i>Total</i>	320	100,00%
<b>Education</b>		
Doctoral 3	19	5,93%
Masters 2	142	44,38%
bachelor's degree 1	159	49,69%
<i>Total</i>	320	100,00%
<b>Position</b>		
Position II	25	7,81%
Position III	90	28,13%
Position IV	205	64,06%
<i>Total</i>	320	100,00%
<b>Institution</b>		
Bappeda	146	45,63%
DPKA	102	31,86%
BKA	30	9,38%
Inspectorate	24	7,50%
Setda	18	5,63%
<i>Total</i>	320	100,00%

Source: Data Primer (2018)

Based on Table 1 above, it can be seen the characteristics of respondents in this study, where the number of male respondents reached 69.38%, while female respondents only 30.62%. This condition shows that the number of women in structural positions is still minimal. Data from the Aceh Civil Service Agency show that the composition of structural officials in the Aceh government was 69% male and 31% female. Likewise, it can be seen from the percentage of education, the average civil servant is still a bachelor's degree (S1) of 49.69%, for Masters (S2) 44.38% and the rest Doctoral (S3) 5.93%.

### 3.2. Data analysis

Before the implementation of hypotheses, assumptions need to be test beforehand whether the data from this study is feasible for analysis or not. The initial stage will be tested outlier assumptions using the Mahalanobil distance method, test the normality and see the value of loading factors, namely Confirmatory Factor Analysis (CFA) and reliability. The following will display the results of data processing in Table 3:

Table 3. Result of Loading Factor, AVE and Composite Reliability

Variable	Skewness		Kurtosis		AVE	Composite Reliability
	Value	C.R	Value	C.R		
High Performance Work System	0.234	1.345	0.345	1.523	0.830	0.789
Strategic Readiness of Intellectual Capital	-0.114	-0.834	0.237	0.864	0.756	0.668
Government Innovation Capability	-0.222	-1.622	0.306	1.117	0.550	0.567
Government Performance	-0.277	-1.656	0.677	1.474	0.768	0.634

Source: Data primer 2018

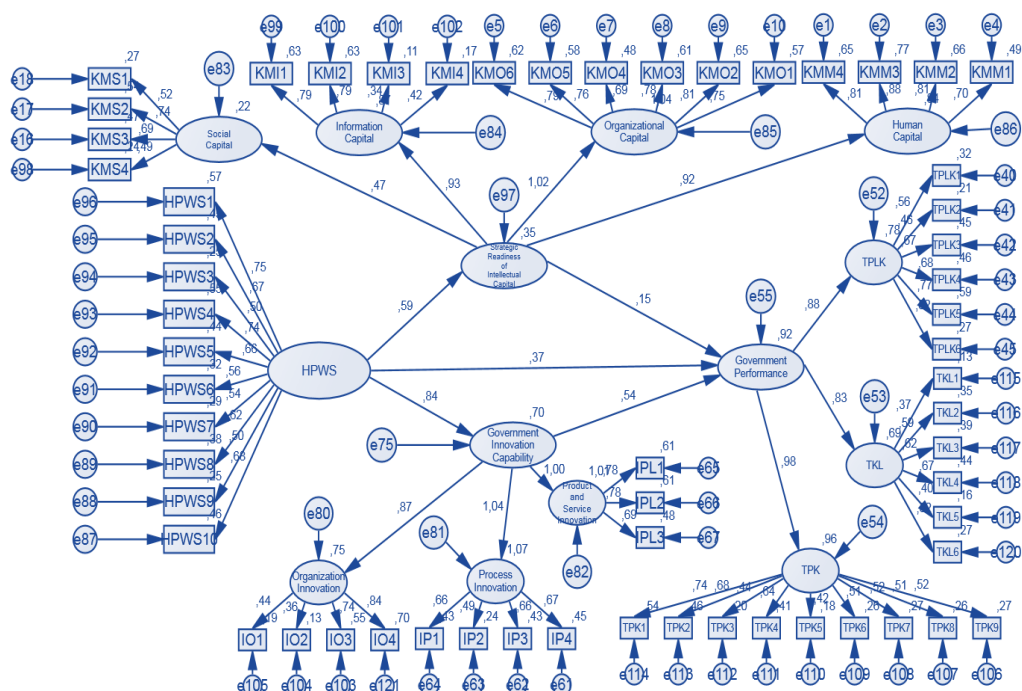
All variables shown in Table 3 have a value of Average Validity > 0.5 and Composite Reliability > 0.6. This shows that all dimensions and indicators of each variable are feasible for further analysis. However, these results indicate that the composite reliability value for the Government Innovation Ability variable is 0.567 < 0.60, the value is marginal because it approaches 0.60. Whereas for overall normality the variables in this study are normally distributed. The research variables and their dimensions have fulfilled the assumptions of structural equation modeling (SEM) so that the next step is to build a structural model to analyze the influence between the variables studied in this study. After going through several stages of analysis, the structural model built in this study is good enough to test the influence of variables with the value of goodness of fit as follows:

Table 4. Goodness of fit

Goodness-of-Fit Index	Cut off Value	Model Test Result	Information
Degree of Freedom (DF)	Positive (+)	320,000	Positive
$\chi^2$ (Chi-Square)	Expected Small	756,169	Acceptable
Significant Probability	$\geq 0,05$	0,000	Acceptable
CMIN/DF	$< 2,00$	2,357	Acceptable
GFI	$\geq 0,90$	0,880	Marginal
RMSEA	0,05 – 0,08	0,065	Good
AGFI	$\geq 0,90$	0,954	Good
TLI	$\geq 0,90$	0,923	Good
CFI	$\geq 0,90$	0,954	Good
NFI	$\geq 0,90$	0,905	Good
PNFI	0,60 – 0,90	0,763	Good
PGFI	$\geq 0,90$	0,907	Good

Source: Data primer Processed with AMOS, 2018

Figure 2. Structural model



	Direct effect	S.E	C.R	Indirect effect	Sobel test	S.E (Ind)	P
Strategic Readiness of Intellectual Capital← High Performance Work System	0.228	0.045	5.098				0.001
Government Innovation Capability← High Performance Work System	0.793	0.081	9.776				0.000
Government Performance← High Performance Work System	0.288	0.072	4.012				0.000
Government Performance← Strategic Readiness of Intellectual Capital	0.120	0.058	2.057				0.040
Government Performance← Government Innovation Capability	0.477	0.082	5.465				0.000
Government Performance← Strategic Readiness of Intellectual Capital← High Performance Work System				0.027	1.915	0.014	0.055
Government Performance← Government Innovation Capability← High Performance Work System				0.354	4.762	0.074	0.000

Source: Data Primer Processed (2018)

The results of hypothesis testing indicate that all significant variables with t-value are greater than t-table = 1.980 (n = 320). First, the direct effect of the high-performance work system on government implementation performance ( $\beta = 0.288$ ; t-value = 4.012) is significant, with these results, the H1 hypothesis in this study is accepted. Second, the direct effect of the high-performance work system on strategic intellectual capital readiness ( $\beta = 0.228$ ; t-value = 5.098) is significant, with these results the H2 hypothesis in this study is accepted. Third, the direct effect of the high-performance work system on government innovation capability ( $\beta = 0.793$ ; t-value = 9,776) is significant, with this result the H3 hypothesis in this study is accepted. The four direct effects of strategic intellectual capital readiness on government implementation performance ( $\beta = 0.120$ ; t-value = 2.057) were significant, with these results the H4 hypothesis in this study was accepted. The five influences of Government Innovation Ability on government implementation performance ( $\beta = 0.477$ ; t-value = 5.465) are significant, with this result the H5 hypothesis in this study is accepted.

Finally, for the indirect effect, the role of the strategic readiness of intellectual capital in mediating the influence of the high-performance work system on government performance is significant ( $\beta = 0.027$ , Sobel = 1.915) and is mediated on a financial basis. With these results, the H6 hypothesis in this study was accepted. In addition, the indirect effect of government innovation capability in mediating the effect of high performance work systems on government execution performance is significant ( $\beta = 0.354$ , Sobel = 4.762) and is financially mediated. With these results, the H7 hypothesis in this study was accepted.

## Discussion and conclusion

After testing the research hypothesis, can concluded that each variable has a very significant positive influence. Based on the results of Table 3, it shows that the influence of high-performance work system variables has a positive and significant effect on the performance of the administration of the Acehese government. The results of this study reinforce the results of a study conducted by (Abualoush, Masa'deh, Bataineh and Alrowwad 2018, 279–309) that a high-performance work system can lead to better performance achievement in various organizations, both profit and non-profit, by using the same basic concepts and principles, namely: Job Infrastructure and Job Security. This research has refuted the opinions of other researchers who stated that some components among HPWS practices were negatively correlated with organizational performance (Cappelli and Neumark 2001, 737–775; Godard 2001, 776–805). Likewise, the variable influence between high-performance work systems on the strategic readiness of intellectual capital has a positive and significant effect. This study supported by previous research, which states that a high-performance work system is an effective medium for providing organization's stock of human capital, including through selective recruitment and comprehensive staffing (Wright, Smart and McMahan 1995, 1052–1074) high-performance work systems help develop organizational capital, through teamwork, knowledge management, and value creation (Wang and Chen 2013, 861–879). The high-performance work system also believed to have an important role in developing an organization's social capital, by building good relationships, communication, and interaction with various stakeholders (Wang and Chen 2013, 861–879).

Intellectual capital as a strategic readiness of intangible assets has a direct relationship with organizational strategy and performance. Intangible assets, which are associated with intellectual capital (human capital,

information capital and organization capital) influence company performance by enhancing internal processes more critically to create value for customers and shareholders (Kaplan, Norton and Davenport 2004). After testing the direct effect based on table 3 above, the results show that the influence of the Intellectual Strategic Readiness variable on Government Implementation Performance shows positive and significant results. The results of this study support the research conducted by (Han and Li 2015, 40–56) which states that to realize a superior innovative performance for a company or organization depends on the intellectual capital of the company or organization and its ability to feel opportunities and challenges, make good and timely decisions, and facilitate the necessary changes efficiently.

Testing the last hypothesis shown in Table 3, after testing the effect indirectly, the value of the indirect effect of the High Performance Work System on Government Implementation Performance through Strategic Intellectual Capital Preparedness shows positive and significant results. The results of this study indicate that there is an indirect influence between High-Performance Work Systems on Government Implementation Performance through partial Intellectual Capital Strategic Readiness. From the results of this estimation, can concluded that Intellectual Capital Strategic Readiness is not strong enough to mediate the relationship between High-Performance Work Systems and Government Management Performance, but there are still other variables that can complement the influence of the relationships between these variables:

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## Analysis of the Impact of Regional Expenditure on Human Development: A Study of Jambi Province, Indonesia

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### Abstract:

The development of a region is not only focused on physical development, but human development is also an important factor for achieving prosperity, because humans are agents who become economic actors. Regions in Indonesia have limitations in carrying out human development which in turn is a human development index that is relatively low. This study aims to analyze regional expenditure and population growth towards human development. The study was conducted at the regency / municipal governments in Jambi Province, namely 9 Regencies and 2 Cities. This type of research is explorative. The type of data analyzed is panel data. The variable of this research is human development as a dependent variable. Regional expenditure and population growth are independent variables. The data analysis technique to test the hypothesis is panel data regression. Research findings prove that: 1) Regional expenditure has a significant effect on human development, 2) Population growth has a significant effect on human development. This study uses a quantitative method to analyze population growth variables towards human development which is still rarely done from previous research.

**Keywords:** regional expenditures; population growth; human development.

**JEL Classification:** O15; O18.

### Introduction

Human capital is one of the important factors in building a nation. This is related to the view that humans are human capital. This strategy requires a large investment in education, training and health. The development of a country should not only focus on physical development, but human development is also an important factor for achieving prosperity, because humans are agents who become economic actors related to production factors. Human development index can be used to measure the success or performance of human development in a country or region (Fattah 2012).

Budget policy can affect the economy through three main aspects, namely resource transfer, incident (income distribution) and output effect (separation of output). In other words, government budget policies can influence the allocation of inputs in an economy. Thus, human development is a necessity for local governments to provide an adequate portion for the realization of increased welfare in society. In order to realize areas with high human quality, the government uses its local government budget to finance development in these sectors.



Some of the approaches that have been carried out by economists and previous researchers about explaining that regional pigs and population growth are factors that affect human development (Edeme 2014). Regional expenditure is an important instrument in regional government, because regional expenditure is a means for regional governments to achieve goals for achieving regional development. Therefore, the effectiveness and efficiency of regional expenditures must be the main factor, if it is wrong to spend regional budgets, it will have an impact on not achieving development goals, namely welfare (welfare society). Some research results show that spending in the public sector is very useful for improving human development (Joshi 2012, Prasetyo 2013). Research has found that regional spending has a significant effect on human development (Bhanumurty 2016, Edeme 2014).

Indonesia's population growth during the period 2007-2016 has increased by 14.67%. When viewed from a fairly high population growth rate, it should be suspected that high population growth and uncontrolled participation also hamper the pace of human development in Indonesia. Thus, the transfer fund for the purpose of human development in some regions does not significantly affect human development. The magnitude of the age group of children caused by high birth rates is an inhibiting factor for reading economic development. This is due to the rapid rate of population growth which is not proportional to the absorption of employment due to the low quality of human resources.

The objective of the study is to examine the effect of regional spending and population growth on human development. There are two hypothesizes of this study. The first is that regional expenditure has a significant effect on human development. The second hypothesis is that population growth has a significant effect on human development. The paper consists of introduction, literature review, methodology of research, results and discussions, and the brief conclusion of the research.

## **1. Literature review**

The term human development (human development) was first popularized by the United Nations Development Program (UNDP) in 1990 and published regularly in the annual report in the form of the Human Development Report (HDR). In the HDR an annual report is issued regarding the Human Development Index (HDI) or Human Development Index (HDI). The Human Development Index (HDI) measures human development outcomes based on a number of basic components of quality of life. As a measure of quality of life, HDI is built through a basic three-dimensional approach. These dimensions include longevity and health, knowledge, and a decent life. These three dimensions have a very broad understanding because they are related to many factors. Measurement of health dimensions used life expectancy at birth. Furthermore, to measure the dimensions of knowledge used a combination of indicators of school-old expectations and average length of school. As for measuring the dimensions of decent life, it is used an indicator of the ability of the purchasing power of the community to a number of basic needs which are seen from the average amount of expenditure per capita as an approach that represents the achievement of development for decent living.

According to Widodo (2011) human development is one indicator for the progress of a country. A country is said to be advanced not only calculated from gross domestic income but also includes aspects of life expectancy and education of its people. According to Law No. 33 of 2004 concerning Financial Balance between the Central Government and Regional Governments, regional expenditures are interpreted as all regional obligations recognized as deductions from net worth in the period of the relevant fiscal year. Regional expenditures are expenditures made by local governments to carry out their authority and responsibility to the community and government above. In addition, regional expenditure is also all regional obligations that are recognized as a reduction in net worth in the period of the relevant fiscal year. Regional expenditures that are appropriately allocated to expenditure posts needed by the community will promote positive growth in an effort to improve the welfare of the community (Zebua 2014).

The phenomenon that occurs in many regions in regional expenditures, namely in the regional expenditure and budget is the expenditure of employees in indirect expenditure, up to more than 50% of the total indirect expenditure, this gives several impacts, one of which is waste in the employee section. The allocation of funds that should be maximized for basic community services is used to finance personnel expenditure, consequently reducing budget allocation for public services.

In general, population growth in developing countries is very high and large in number. The problem of population growth is not just a matter of number, the problem of the population also concerns the interests of development and the welfare of humanity as a whole. In the context of development, the views of the population are divided into two namely those who regard it as an obstacle to development and some consider it as a driver of development.

According to Todaro (2011) Population as a driver of development because a larger population is actually a potential market that is a source of demand for various kinds of goods and services which will then move various kinds of economic activities so that they can create economies of scale in production that will benefit all parties, reduce production costs and create sources of supply or supply cheap labor in sufficient quantities so that it can stimulate improving people's welfare which means poverty will decline.

Research by Guney (2017) stated that the effect of population growth towards the sustainable development varied based on the development of countries. Population growth rate in developing countries had a negative effect on sustainable development, while population growth in developed countries affected the sustainable development positively.

According to Wakarmamu (2019), the government must be able to allocate the regional budget in a proper way as it had an impact on gross regional domestic product and human development index. Spending with the purpose of increasing the welfare of population seems to lead the improvement of human development index. Thus, governments have to prioritize human resources to see the increasing of human development index.

## 2. Methodology

This research was carried out in Jambi Province, Indonesia, with a geographical location at -1.609972 and 103.607254. The province has a land area of 50,058 km<sup>2</sup>. Jambi province is divided into nine regencies and two cities. Jambi is chosen because the human development index of Jambi was stagnant with the average of 1.08 point per year, from 2010-2016. The type of data analyzed is panel data. The variable of this research is human development as a dependent variable. Regional expenditure and population growth are independent variables.

Human development in this study was measured from 3 aspects consisting of education, health and per capita level (Todaro 2011). Regional Expenditures are all expenditures of the district and city governments in Jambi Province to finance all regional needs. Regional expenditure in this study was measured from 4 types of regional expenditure consisting of goods and services expenditure, capital expenditure, social expenditure and grant expenditure (Edeme 2014 and Fattah 2012). The population growth referred to in this study is the level of population growth of each district and city in Jambi province.

The data analysis technique to test the hypothesis is panel data regression. The panel data regression equation is as follows:

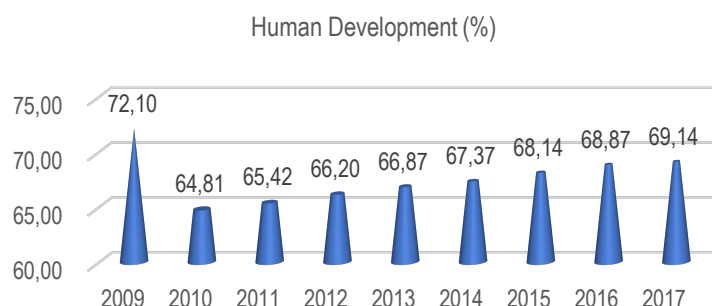
$$PM_{it} = \alpha + \beta_1 BD_{it} + \beta_2 PPd_{it} + e \quad (1)$$

where: PM = Human Development; BD = Regional Expenditures; PPd = Population Growth; A = constant; B = Regression coefficient; E = Error term.

## 3. Result

### 3.1. Descriptive research variable

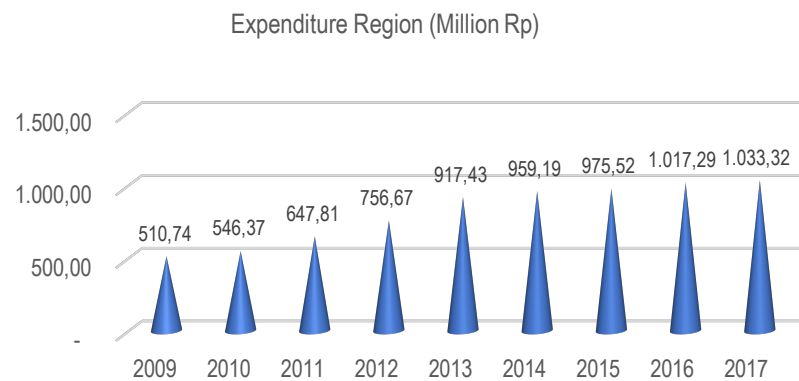
Figure 1. Curve of Human Development - %



Source: Research result

Based on the results of the descriptive analysis it is known that the average human development in the Regency/City of Jambi Province for the period 2009-2017 is 67.66% with the highest value being 77.45% and the lowest value 67.21% and the standard deviation value of 4.15%. This data shows that human development in the Regency/City of Jambi Province is not yet high since the value of above 80% is expected to be achieved. In other words, it can be explained that the achievements of human development based on a number of basic components of quality of life have not been maximized. Especially for 2009 the rate of growth of district / city HDI is higher, namely at 72.10%, because the HDI measurement indicators still use the old standard.

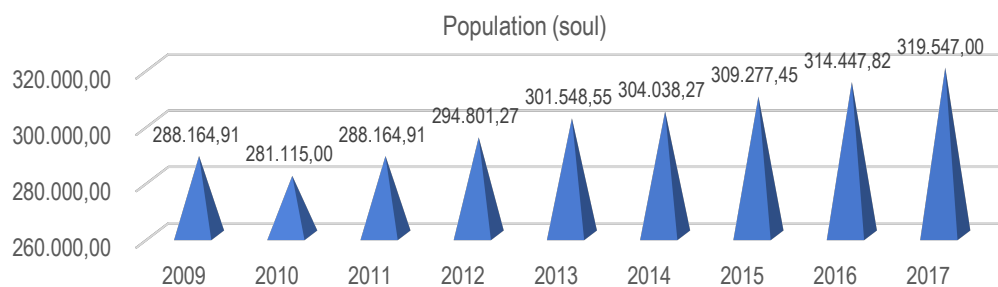
Figure 2. Regional shopping curve



Source: Research result

The average total expenditure of the Regency/City in Jambi Province for the period 2009-2017 is 818.26 billion with the highest value being 1.52 trillion and the lowest value of 97.15 billion and the standard deviation value of 255 billion. This data shows that district/city expenditure in Jambi Province for the period 2009-2017 is quite high, but it appears that there is a gap in regional expenditure because the distance between the highest value and the lowest value is too far. This certainly proves that there is a striking difference between each region in terms of the amount of regional expenditure.

Figure 3. Population growth curve



Source: Research result

The average total population of regencies/cities in Jambi Province for the period 2009-2017 was 300,122 people with the highest score was 591,134 people and the lowest value was 82,293 billion and the standard deviation was 114635.7 people. This data shows that the population of regencies/cities in Jambi Province varies.

### 3.2. Discussion

Based on the Hausman test, the Prob value is known. Random cross-section is 0.7858, the value is greater than alpha ( $\alpha = 0.05$ ) so it can be concluded that the random effect model is more appropriate than the fixed effect model. Testing the effect of regional spending and population growth on human development is done using the random effect panel data regression model. Based on the results of panel data regression data analysis, the panel data regression equation can be written as follows:

$$PM_{it} = \beta_0 + \beta_1 BD_{it} + \beta_2 PDDK_{it} + U_i \quad (2)$$

$$PM = 40,61 - 0,004 BD + 0,0001 PDDK \quad (3)$$

The results of data analysis with panel data regression can be interpreted as follows:

- The value of F count is 19.58 with a probability value of 0.00 indicating that regional expenditure and population simultaneously have a significant effect on human development in the regencies / cities in Jambi Province;
- The R-squared value is 0.7320, it can be interpreted that the magnitude of the influence of regional spending and population on human development in regencies/cities in Jambi Province is 73.20% and the remaining 26.80% is the influence of other variables outside the model research. This indicates that

regional spending and population have an important role to play in changing the size of human development. More simply it can be stated that the high and low of human development is determined by the size of the regional expenditure and the population;

- Regression coefficient of regional expenditure variable of -0.004 which has a negative sign, indicates that there is a negative influence on regional expenditure on human development. If regional expenditure increases by one percent, it will reduce construction development by 0.004%, assuming other variables do not change (*ceteris paribus*);
- Variable regression coefficients of the population of 0,0001 which are negative, indicate that there is a negative influence of the population on human development. If the population increases by 1% it will increase human development by 0,0001% assuming other variables do not change (*ceteris paribus*).

The first hypothesis of this study is that regional expenditure has a significant effect on human development. Based on the results of data analysis, it is observed that the regression coefficient value of the regional variable is -0.004 with a probability value of 0.01. The probability value is smaller than alpha ( $0.01 < 0.05$ ). Thus it can be stated that regional expenditure has a significant negative effect on human development so that the first hypothesis is accepted.

The second hypothesis of this study is that population growth has a significant effect on human development. Based on the results of data analysis it is known that the regression coefficient value of the human development variable is 0,0001 with a probability value of 0,0001. The probability value is smaller than alpha ( $0,0001 < 0,05$ ). Thus it can be stated that population growth has a significant negative effect on human development so that the second hypothesis is accepted.

The following describes the influence of regional spending and population growth on human development.

#### *1. Effects of regional expenditures on human development*

Based on the results of data analysis it is observed that regional expenditure has a significant effect on human development. This proves that human development will be determined by the size of regional expenditure. The effect coefficient of regional expenditure on human development is negative, indicating that the higher regional expenditure will certainly reduce human development because the regional expenditure is mostly allocated for physical expenditure.

The current increase in the share of expenditure has a statistically positive and significant impact on human development. Conversely the relationship between the component of capital and human development expenditure is negative (Edeme 2014).

Research by Sanggelorang (2015) concluded that the variable government expenditure in the field of education has a positive effect that is increasing by 0.870 and statistically significant towards the HDI, while the variable government expenditure in the health sector has a negative effect, namely -0.438 and statistically no effect on HDI. Physical regional expenditure is very vulnerable to leakage both from planning and from the expenditure itself. Hence, inefficiencies in public spending will have an impact on the slow pace of human development. Other studies have shown a negative relationship between public spending and the results of both the health and education sectors due to differences in spending effectiveness, one of which is a high level of corruption (Bhanurmuty 2016). The results of this study are supported by the opinion of the 1974 Research Corporation concluding that well-planned development tends to reduce the cost of capital to the government by one third.

The second reason is institutional inefficiencies such as weak capacity and leakage in public spending. Poor budget management in the public sector that is inefficient in using available funds reduces the impact of public spending on desired outcomes. The effectiveness of public spending in improving health and education outcomes can increase if a country has good governance and good state institutions. The formulation of implementation and monitoring budgets are not efficient; thus human development outcomes cannot be achieved even though the government budget is more allocated into resources (Bhanurmuty 2016).

In line with Rajkumar (2008) development of human beings can depend on economic growth as well as on the interventions of public policy the efficiency of public expenditure and the efficiency of the level of institutions in the economy. The findings of this study are also supported by the findings of Laisina study (2015), which stated that regional expenditure had a significant negative effect on human development. Laisina study (2015) influenced government spending in the health sector is negative for human development, because during the research period 2002-2013 the South Sulawesi government allocated a lot of budget for health infrastructure (Muliza 2017).

Research of Edeme (2014) in Nigeria in the period 1999-2012 influenced the spending of the public sector on human development. The research conclusions found that routine expenditure on health, energy and

environmental protection had a positive effect on human development, while repetitive rural development expenditures had a negative impact on human development.

The research of Bhanumurthy (2016) at the District Level of Paradesh found that development spending alone was not enough to achieve human development results because public expenditure activities improved with better governance indicators. This means that human development is largely determined by the portion of regional expenditures and a higher level of efficiency, and the accuracy of the functions of spending and instruments for increasing human development must be a concern.

## 2. Effect of population growth on human development

Based on the results of data analysis it is known that population growth has a significant effect on human development. This proves that human development will be determined by the size of population growth. The influence coefficient of population growth on human development is positive indicating that the higher population growth will certainly increase human development.

The results of this study stated that human capital is one of the important factors in the economy. The quality of human capital economic performance will be better if the increasing of population will rise the economy and production sectors. Lai (2003) stated that an increase in population must be accompanied by an increase in the workforce, thus the employees are able to compete and succeed in the global market to utilize globalization. Hence, education and training must be the priority.

## Conclusion

This study found that regional expenditure has a significant effect on human development. This proves that human development will be determined by the size of regional expenditure. The effect coefficient of regional expenditure on human development is negative, indicating that the higher regional expenditure will certainly reduce human development because the regional expenditure is mostly allocated for physical expenditure.

Furthermore, it was found that population growth had a significant effect on human development. This proves that human development will be determined by the size of population growth. The influence coefficient of population growth on human development is positive indicating that the higher population growth will certainly increase human development.

The influence of regional expenditure and population on human development in regencies/cities in Jambi Province is 73.20% and the remaining 26.80% is the influence of other variables outside the research model. This indicates that regional spending and population have an important role to play in changing the size of human development. More simply it can be stated that the high and low of human development is determined by the size of the regional expenditure and the population.

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## The Effect of Double Tax Treaties on Foreign Direct Investment Inflows: The Study on the Indonesia Treaties Network

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### Abstract:

This paper examines the impact of the Indonesia double tax treaties (DTTs) network with developed countries on Indonesia's inward foreign direct investment (FDI) for the period 2005-2017 and investigates the causes of the result. Using Indonesia DTTs as a dummy variable and other data under the Capability Maturity Model (CMM) framework over 41 sample countries, this paper finds that the Indonesia DTTs network with developed countries does not have any statistically significant correlation with the inward FDI. When the analysis is extended to examine the effect of the DTTs in three and six years after the implementation of the DTTs, the results remain the same. This paper finds also that, in the case of Indonesia, DTTs do not affect the inward FDI because foreign investors consider more on the non-tax factors and most of Indonesia's DTTs were not negotiated for economic reasons.

**Keywords:** Indonesia; double tax treaty; CMM framework; foreign direct investment.

**JEL Classification:** F21; F53; H26; H87.

### Introduction

As of 2017, Indonesia had 66 DTTs in force with both developed and developing countries. Comparing to developed countries, based on IBFD Tax Portal data, Indonesia's DTTs were comparable to the those of United States (66 DTTs) and Bulgaria (69 DTTs), and were higher than those of Australia (53 DTTs) and New Zealand (45 DTTs). Among ASEAN countries, with its relatively extensive DTTs network, Indonesia was ranked third after Singapore (86 DTTs) and Malaysia (81 DTTs).

Regarding the inward FDI, for the period of 2013-2017, UNCTAD reported that Indonesia was in the position of the 22<sup>nd</sup> largest global FDI recipient at US\$84,252.97 million. Among ASEAN countries, Indonesia was in the second largest after Singapore that was the fifth largest in the world at US\$333,134.05 million. This ranking showed that Indonesia was a reasonably attractive FDI destination, especially compared to ASEAN countries.

Nevertheless, the correlation between the Indonesia DTTs network and the realization of FDI inflows into Indonesia was questionable. While theoretically the impact of DTTs on FDI is still inconclusive (Bin Saghir Ahmed *et al.* 2015), and Indonesia as a developing country needs a good understanding of the benefits of its DTTs network, this paper is intended to examine the impact of the Indonesia DTTs network with developed countries on the inward FDI and investigates the causes of the result.

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## 1. Literature reviews

### 1.1. Theoretical framework of the correlation between double tax treaties and foreign direct investment

FDI is generally considered as an important variable of economic development, especially for developing countries as host countries. Hill (2011) advised that the main benefits of inward FDI for a host country are resource-transfer effects, employment effects, balance-of-payments effects, and effects on competition and economic growth. In terms of the resource-transfer effects, FDI benefits the host country by supplying capital, technology, and management resources, that may support that country's economic growth. The effects on employment arise when FDI employs a number of local employees and encourages job creation by local suppliers as a result of the investment. FDI may help the host country's balance-of-payments accounts when the FDI drives a substitute for imports of goods or services and promotes exports to other countries. The effects on competition arise when FDI takes the form of a greenfield investment that increases the number of players in a market, thus increasing competition that stimulates capital investments by firms due to rivalry that lead to greater economic growth.

Taxation is one of the determinants for investors to locate their investment in other countries since it can affect the rates of return on capital. As governments use their sovereignty in establishing their own tax policies to ensure their tax revenues, the lack of worldwide harmonization particularly on income taxes may lead to a problem of international double taxation. The international double taxation as undesirable consequences of economic transactions between countries is one of the most visible obstacles that may deter cross-border investment. International double taxation arises when a specific taxpayer is taxed in two or more jurisdictions on the same tax base. International double taxation may interfere in cross-border transactions of goods and services, flows of capital, transfers of technology, and exchanges of persons. Therefore, the Organization for Economic Co-operation and Development (OECD) stresses the importance of removing the obstacles that double taxation presents to the development of economic relations between countries (OECD 2010).

DTTs are the main instrument for coordinating the tax systems of countries and widely used type of international agreement for eliminating international double taxation. DTTs are agreements, generally in the form of bilateral agreements, composed of a set of mutual adjustments and concessions between the tax laws and treasuries of the countries (Isenbergh 2005). To eliminate double taxation, DTTs are designed to allocate taxing rights on various types of income or gains either to the home country or to the source of income country (host country). When DTTs allow both countries to tax the same income or gains, DTTs stipulate the method of eliminating double taxation.

For its function of removing double taxation problems, in 1976, the United Nations Economic and Social Council (ECOSOC) noted that it was *"confident that tax treaties between developed and developing countries can serve to promote the flow of investment useful to the economic development of the latter, especially if the treaties provide favorable tax treatment to such investments on the part of the countries of origin, both by outright tax relief and by measures which would ensure to them the full benefit of any tax incentives allowed by the country of investment"* (United Nations 2003). With this proposition, developing countries often negotiate DTTs in order to attract foreign investment.

Whether or not DTTs enable to attract FDI, DTTs are becoming one of the important international aspects of many countries' tax system. The International Bureau for Fiscal Documentation (IBFD) records that there are more than 3,000 DTTs in force involving more than 200 economies. This number is expected to continue to grow.

### 1.2. Empirical studies on the impact of double tax treaties on inward foreign direct investment

Many studies have been conducted to observe the impact of DTTs on inward FDI. Whether DTTs affect FDI is crucial particularly to developing countries. Developing countries must spend their extra efforts and other resources to negotiate and enter into DTTs with other countries. They may sacrifice their tax revenue because DTTs typically prevail residence-based over source-based taxation, and developing countries are usually net capital importers. This potential loss may be settled if developing countries can expect to attract more FDI in compensation.

DTTs are commonly relied upon to promote FDI since they may diminish the hindrances to the flows of investment, such as double taxation, tax discrimination, legal uncertainty, and excessive taxation. DTTs harmonize the definitions of tax-related terms and the taxing rights of treaty partners so as to solve the problem of double taxation. DTTs may supersede the domestic laws of treaty partners in order that they remove tax discrimination, increase legal certainty, and reduce excessive taxation in the source country. Under these facilitations, it turns into a common perception that DTTs encourage the flows of investment between treaty partners.

In his study to answer whether DTTs attract FDI inflows to developing countries, Neumayer (2007) found that developing countries enjoyed the benefit of having DTTs with developed countries in the form of increasing



overall FDI stock and share of FDI stock, as well as receiving higher FDI inflows and share of FDI inflows. However, this conclusion was only relevant to the group of middle-income developing countries. It was not applicable to low-income developing countries. To the knowledge of Neumayer, this was the first study to provide robust empirical evidence that DTTs increase FDI to developing countries.

On the other hand, to the same question, Blonigen and Davies (2002) had a different answer. In the effort to predict the correlation between DTTs and FDI activity, Blonigen and Davies differentiated new DTTs from old DTTs. While they found difficulties in identifying the effect of the old DTTs on FDI activity, they concluded that the new DTTs formation did not promote new investment. Besides, in some cases, they observed that because DTTs were also functioned to tackle tax evasion, DTTs might result in decreasing of foreign investment. This conclusion definitely contradicted the claim that DTTs promote FDI.

Dagan (2000) even criticized the objective of DTTs to eliminate international double taxation. He suggested that DTTs were not really required to alleviate double taxation since a unilateral law could do it in more efficient ways. It appeared that DTTs merely function as an instrument to harmonize contracting states' tax laws and facilitate tax administration issues. He speculated also that DTTs would transfer the tax revenue from the less developed countries to the more developed countries. He concluded that DTTs' objective of preventing double taxation, thus promoting FDI, is a myth.

Recently, Dong (2019) examined the effect of DTTs on FDI inflows in 10 Association of Southeast Asian Nations (ASEAN) countries from 1989 to 2016 and found that DTTs had little or even negative impact on FDI inflows into the Southeast Asia region. When the DTTs were differentiated into new and old DTTs, Dong noted that the new DTTs had a little impact on the FDI inflows, while the older DTTs had negative impact on FDI.

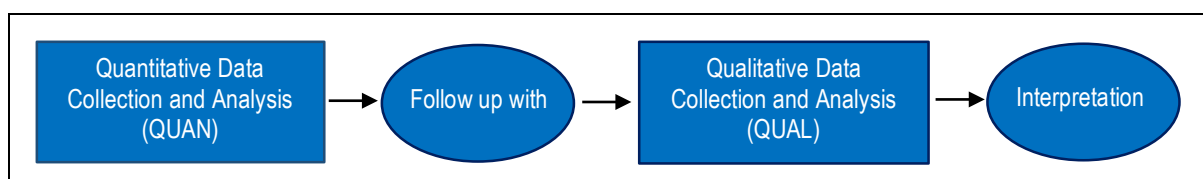
Whereas the benefits of DTTs are still debatable, Vissaro (2019) revealed that many developing countries came into awareness that some of their DTTs resulted in loss of revenue from source taxation. This condition has led some developing countries to review the DTTs they have. Argentina, Mongolia, South Africa, and Zambia were the examples of countries that had renegotiated some of their DTTs.

## 2. Methodology

This study utilizes an explanatory sequential mixed method that involves quantitative and qualitative methods in a two-phase project as depicted in Figure 1. In the first phase, the study analyzes quantitative data with a regression method. Next, the results are followed up with a qualitative analysis to present more detail explanations. It is viewed as an explanatory method since the study is intended to identify the cause-and-effect relationships of the variables. It is sequential as the initial quantitative phase continued by the qualitative phase.

The purpose of this explanatory sequential mixed method is to investigate the causes of whether or not the Indonesia DTTs network influences the inward FDI by obtaining quantitative results from a panel data regression method and then following up with a qualitative study by means of literature study, in-depth interview, focus group discussion, and observation. In the quantitative phase, the CMM framework is used in the regression method to examine the impact of the Indonesia DTTs network with developed countries on the inward FDI. In the qualitative phase, the discussion focuses on the determinants of FDI and the motivations of negotiating the DTTs.

Figure 1. Explanatory sequential mixed method



Source: Creswell (2014)

### 2.1. Capability maturity model framework

To examine the impact of the Indonesia DTTs network with developed countries on the inward FDI, this study uses the knowledge-capital model established by Carr, Markusen, and Maskus, which is known as CMM framework. As adopted by Blonigen and Davies (2002), the CMM framework is specified by the following equation:

$$FDI_{ij} = f(\text{SUMGDP}_{ij}, \text{GDPDIFSQ}_{ij}, \text{SKDIFF}_{ij}, \text{SKDIFF}_{ij} * \text{GDPDIFF}_{ij}, (\text{SKDIFF}_{ij})^2 * \text{T\_OPEN}_j, Z_{ij}, \text{TREATY}_{ij}) \quad (1)$$

$FDI_{ij}$  as the dependent variable is an amount of FDI inflows from a parent or home country (i) to Indonesia as a host country (j). The first five independent variables of the model are the specific variables of the CMM framework.  $\text{SUMGDP}_{ij}$  computes the summation of Indonesia's and its partner country's gross domestic product

(GDP).  $GDPDIFSQ_{ij}$  is calculated by squaring the difference between Indonesia's and its partner country's GDP. Variables of  $SUMGDP_{ij}$  and  $GDPDIFSQ_{ij}$ , that measure the magnitude and the distinction of the market size of the countries, are intended to capture the activity of horizontal FDI. It is presumed that the larger and more similar market size of the countries will encourage more horizontal FDI activity. The larger  $SUMGDP_{ij}$  is expected to drive the larger horizontal FDI. On the contrary, a large  $GDPDIFSQ_{ij}$  is expected to discourage horizontal FDI.

Next,  $SKDIFF_{ij}$  compares the skill level of the citizens of the partner country and Indonesia. It is predicted that  $SKDIFF$  correlates positively with FDI.  $SKDIFF_{ij} * GDPDIFF_{ij}$  describes how the countries' difference in skill level interacts with the difference in GDP. This variable is predicted to have a negative correlation with FDI.  $(SKDIFF_{ij})^2 * T\_OPEN_{ij}$  illustrates the interaction between the squared skill difference and trade openness in Indonesia. The correlation between this variable and FDI is predicted to be positive. These three variables capture the activity of vertical FDI as they consider the differences in skill level between the two countries.

In addition to the five independent variables, this paper includes the following variables as the control variables in the CMM framework. The first control variable is  $DISTANCE_{ij}$ , which measures the distance between partner countries and Indonesia, that estimates the cost of trade and transportation if a firm decides to become a multinational enterprise (MNE). Then,  $T\_OPEN_i$  and  $T\_OPEN_j$  are also included in the control variables.  $T\_OPEN_i$  measures the trade openness in the partner country, and  $T\_OPEN_j$  is the trade openness in Indonesia.  $T\_OPEN_i$  and  $T\_OPEN_j$  are among the determinants of FDI since they affect the business of MNE in exporting and importing its raw materials, intermediate goods, and finished products. The correlation between the trade openness in the partner country and FDI inflows in Indonesia is predicted positive because it allows the affiliate company in Indonesia to deliver products back to its parent company. Whereas, the trade openness in Indonesia may deter FDI activity since the foreign company has an alternative to serve Indonesia's market through export rather than creating FDI.

$TREATY_{ij}$  is the last independent variable, which is the focus variable of the model. Blonigen and Davies (2002) realized that there are substantial measurement issues in quantifying this variable since individual DTTs certainly differ from each other. Therefore, DTTs will be not treated individually but collectively.  $TREATY_{ij}$  is valued "1" if the two countries have a DTT and "0" if they do not. With this,  $TREATY$  measures the impact of overall DTTs on the dependent variable.

## 2.2. Sample of countries and period

In examining the impact of the Indonesia DTTs network on the inward FDI, this study refers to the findings of Neumayer (2007) that DTTs between developed and developing countries increase FDI to developing countries. Therefore, this study initially sets developed countries as samples. The list of developed countries in Table 1 refers to the 2018 World Economic Situation and Prospects (WESP) report (United Nations 2018).

Table 1. Developed countries

Major Developed Economies (G7)	Europe			Other countries
	European Union (Outside G7)	New EU Member States	Other Europe	
Canada	Austria	Bulgaria	Iceland	Australia
Japan	Belgium	Croatia	Norway	New Zealand
France	Denmark	Cyprus	Switzerland	
Germany	Finland	Czech Republic		
Italy	Greece	Estonia		
United Kingdom	Ireland	Hungary		
United States	Luxembourg	Latvia		
	Netherlands	Lithuania		
	Portugal	Malta		
	Spain	Poland		
	Sweden	Romania		
		Slovakia		
		Slovenia		
(7/36)	(11/36)	(13/36)	(3/36)	(2/36)

Source: WESP 2018

In addition to the 36 developed countries, this paper considers it necessary to add several countries from Asia which are Indonesia's main economic partners to the sample. Taking into account the amount of FDI coming from Asian countries and their amount of GDP per capita, this paper includes China, Hong Kong, Korea Republic, Malaysia, and Singapore in the sample. Thus, the sample of countries to this study consists of the following 41

countries: Australia, Austria, Belgium, Bulgaria, Canada, China, Croatia, Cyprus, Czech, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Ireland, Italy, Japan, Korea Republic, Latvia, Lithuania, Luxembourg, Malaysia, Malta, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, and United States.

The sample of countries comprises of:

- developed countries that have both DTT and FDI activity in Indonesia;
- developed countries that have a DTT with Indonesia but do not have FDI activity in Indonesia;
- developed countries that do not have a DTT with Indonesia but have FDI activity in Indonesia.

Developed countries that neither have a DTT with Indonesia nor FDI activity in Indonesia are excluded from the study. The data set of dependent and independent variables of the sample of countries generates cross-section data. The data are also grouped in years, from 2005 to 2017. The data set of dependent and independent variables grouped yearly generates time series data. These time series data combined with the cross-section data produce panel data that includes data of Indonesia's 41 partner countries over a period of 13 years.

### 2.3. Data

The data on FDI used in this study are FDI flows that represent the amount of FDI inflows over a year.  $FDI_{ij}$  is the amount of annual realization of FDI inflows from a partner country as a home country to Indonesia as a host country. The data are obtained from the Statistic of Foreign Direct Investment Realization Based on Capital Investment Activity by Country published by the Indonesia Investment Coordinating Board.

Table 2. Descriptive statistics of the panel data

Variable		Mean	Std.Dev.	Min	Max	Observations
FDI	Overall	341,648	1,040,478	0	9,178,692	N = 533
	Between		853,851	0	4,778,637	n = 41
	Within		608,257	(3,924,914)	4,741,704	T = 13
SUMGDP	Overall	1,987,375	2,861,281	310,765	20,600,000	N = 533
	Between		2,802,866	736,173	16,800,000	n = 41
	Within		712,798	(3,465,654)	7,197,335	T = 13
GDPDIFSQ	Overall	8,309,081	39,000,000	0	345,000,000	N = 533
	Between		38,000,000	32,354	239,000,000	n = 41
	Within		10,800,000	(66,500,000)	114,000,000	T = 13
SKDIFF	Overall	0.2052	0.0504	0.0150	0.3000	N = 533
	Between		0.0500	0.0428	0.2766	n = 41
	Within		0.0099	0.1773	0.2286	T = 13
SKDIFF*GDPDIFF	Overall	115,027	633,190	(238,846)	4,272,037	N = 533
	Between		636,578	(170,140)	3,779,768	n = 41
	Within		69,555	(255,637)	607,296	T = 13
SKDIFF2*MPOR	Overall	94,019	222,524	4	1,565,888	N = 533
	Between		210,341	69	1,066,906	n = 41
	Within		79,192	(445,406)	593,001	T = 13
DISTANCE	Overall	10,220	3,613	898	19,810	N = 533
	Between		3,655	898	19,810	n = 41
	Within		0	10,220	10,220	T = 13
MPOR	Overall	2,364,268	5,408,874	54	35,800,000	N = 533
	Between		5,004,143	1,203	21,800,000	n = 41
	Within		2,186,166	(13,500,000)	16,400,000	T = 13
XPOR	Overall	2,607,192	5,369,783	81	33,700,000	N = 533
	Between		5,212,819	1,010	23,200,000	n = 41
	Within		1,507,984	(6,361,156)	13,100,000	T = 13
TREATY0	Overall	0.74	0.44	0.00	1.00	N = 533
	Between		0.42	0.00	1.00	n = 41
	Within		0.13	(0.02)	1.36	T = 13
TREATY3	Overall	0.72	0.45	0.00	1.00	N = 533
	Between		0.43	0.00	1.00	n = 41
	Within		0.12	(0.12)	1.57	T = 13

Variable	Mean	Std.Dev.	Min	Max	Observations	
TREATY6	Overall	0.70	0.46	0.00	1.00	N = 533
	Between		0.44	0.00	1.00	n = 41
	Within		0.14	(0.23)	1.39	T = 13

Source: Extract from STATA-14

This paper uses nominal GDP data obtained from the United Nations Conference on Trade and Development (UNCTAD) statistic to calculate the  $SUMGDP_{ij}$  and  $GDPDIFSQ_{ij}$  variables. Data on human development index (HDI) published by the United Nations Development Programme (UNDP) are used to proxy for the skill level. Data on Indonesia's import from partner countries used to proxy for the trade openness in Indonesia ( $T\_OPEN_i$ ) are available at Trade Map. These data are necessary to calculate the  $SKDIFF_{ij}$ ,  $SKDIFF_{ij} * GDPDIFF_{ij}$ , and  $(SKDIFF_{ij})^2 * T\_OPEN_j$  variables.

As control variables ( $Z_{ij}$ ), this paper includes distance and trade openness in both partner countries ( $T\_OPEN_i$ ) and Indonesia ( $T\_OPEN_j$ ). The distance is calculated from a geographical database available at GeoNames.  $T\_OPEN_i$  is measured by the partner country's import from Indonesia, and  $T\_OPEN_j$  is represented by Indonesia's import from the partner country. Later on,  $T\_OPEN_i$  and  $T\_OPEN_j$  variables are replaced by  $XPOR_i$  and  $MPOR_j$  variables. Data on the Indonesia's export and import are available at Trade Map.

$TREATY_{ij}$  shows a value of "1" if Indonesia has a DTT with a partner country and "0" if it does not. This paper examines three kinds of DTTs, namely:

- TREATY0 that are in force in the same year as other variables;
- TREATY3 that were in force three years before other variables;
- TREATY6 that were in force six years before other variables. Data on the Indonesia DTTs network are available at ORTax.

Descriptive statistics of the panel data are depicted in Table 2. The "overall" statistics show the mean, standard deviation, minimum value, and maximum value of the data of 533 observations. The "between" statistics provide the calculation based on the data of 41 partner countries aside from the time period. Finally, the "within" statistics are the statistics of the period of 13 years regardless of the countries. The data generate a balanced panel in which each partner countries' data is observed every year.

### 3. The impact of the Indonesia double tax treaties network on inward foreign direct investment

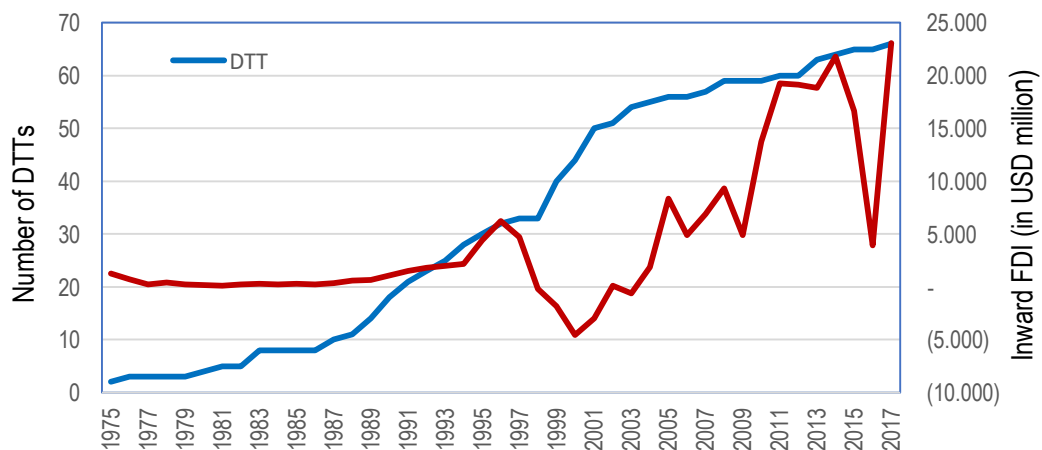
#### 3.1. The Indonesia double tax treaties network and inward foreign direct investment

Indonesia started to negotiate its DTTs in the 1970s. Indonesia's first DTTs are with the Netherlands and Belgium that started to come into effect on January 1, 1975. As of 2017, Indonesia entered into 66 DTTs with the following countries: Algeria, Armenia, Australia, Austria, Bangladesh, Belgium, Brunei Darussalam, Bulgaria, Canada, China, Croatia, Czech, Denmark, Egypt, Finland, France, Germany, Hong Kong, Hungary, India, Iran, Italy, Japan, Jordan, Korea-North, Korea-South, Kuwait, Luxembourg, Malaysia, Mexico, Mongolia, Morocco, Netherlands, New Zealand, Norway, Pakistan, Papua New Guinea, Philippines, Poland, Portugal, Qatar, Romania, Russia, Saudi Arabia, Seychelles, Singapore, Slovak, South Africa, Spain, Sri Lanka, Sudan, Suriname, Sweden, Switzerland, Syria, Taiwan, Thailand, Tunisia, Turkey, Ukraine, United Arab Emirates, United Kingdom, United States, Uzbekistan, Venezuela, and Vietnam. In addition to those 66 DTTs, Indonesia had a DTT with Mauritius that was effective from 1999 to 2004, before being terminated in 2005.

Indonesia is a reasonably attractive investment destination. After the 1997 Asian financial crisis followed by political and economic chaos, FDI inflows in Indonesia started to recover in 2001. In 2005, FDI inflows exceeded the highest inflows before crisis and continued to grow. UNCTAD statistics recorded that the amount of FDI inflows in 2005 was at US\$8,336.25 million and reached US\$23,063.11 million in 2017. From 2005 to 2017, even though fluctuated, the growth was more than 176 percent.

However, when the number of Indonesia's DTTs is connected to the FDI inflows, their correlation is not quite clear. Figure 2 shows that the number of DTTs grew steadily, but the number of the inward FDI went up and down. It was recorded also that the number of the inward FDI was negative sometimes. From 1975 to 1989, the amount of FDI inflows into Indonesia was tremendously low and insignificant to the economy. Starting 1990, the FDI increased moderately until 1997 when Asian financial crisis emerged. Strong decreases occurred in 1997-2000 due to the crisis, and resulted in negative inflows in 1998-2000. The trend started to rebound but fluctuate from 2001 to 2017, with still recording negative inflows in 2001 and 2003.

Figure 2. Indonesia's DTTs and inward FDI (1975-2017)



Source: ORTax and Indonesia Investment Coordinating Board

### 3.2. Results of capability maturity model (CMM) framework analysis

In the first phase of this study, the quantitative method is carried out by doing regression analysis on the panel data based on CMM framework. The CMM framework provides an equation to predict the correlation between FDI as a dependent variable and the interaction of capital, knowledge, treaty, and other factors as independent variables. Using the CMM framework, this paper focuses on examining the impact of the Indonesia DTTs network on its inward FDI.

This paper employs a series of tests to find the best estimation model. The results of the tests on *pooled least square*, *fixed effects*, *random effects*, *Chow test*, and *Hausman test* recommended that the best panel data regression analysis model for this study was the *fixed effect* model. The analysis needed also to transform several data to solve the problem of *multicollinearity* and omitted DISTANCE as an independent variable because of *collinearity*. Furthermore, since the data set of the model does not fulfill regression assumptions of *normality* and *heteroscedasticity*, the analysis runs *seemingly unrelated regression* (SUR) method that can accommodate disturbances of linear regression assumptions (Greene 2012).

Table 3 shows the results of the SUR method applied to examine the impact of TREATY0 on FDI. For the purpose of testing the overall significance of the model, the SUR results provide the *R-squared* ( $R^2$ ) value of 0.6225, the *chi-squared* ( $\chi^2$ ) value of 878.87, and the P value of 0.0000.

Table 3. Seemingly unrelated regression results of TREATY0

Equation	Obs.		RMSE	"R-sq"	chi2	P
FDI	533	8	63,8691.6	0.6225	878.87	0.0000
	Coef.	Std. Err.	Z	P> z	[95% Conf. Interval]	
TSUMGDP	1.48e+08	1.35e+08	1.10	0.273	-1.16e+08	4.11e+08
TGDPDIFSQ	-46.70178	13.89486	-3.36	0.001	-73.93521	-19.46835
SKDIFF	-1,061,090	635,266.2	-1.67	0.095	-2,306,188	184,009.4
TSKDIFF*GDPDIFF	6.03e+07	2.54e+07	2.38	0.017	1.06e+07	1.10e+08
SKDIFF2*MPOR	3.286825	.2215814	14.83	0.000	2.852534	3.721117
TMPOR	155.5327	48.13118	3.23	0.001	61.19729	249.868
TXPOR	1,541,484	3,831,267	0.40	0.687	-5,967,661	9,050,628
TREATY0	-2754.412	76,817.15	-0.04	0.971	-153,313.3	147,804.4
_cons	15,152.48	236,572.8	0.06	0.949	-448,521.7	478,826.7

Source: Extract from STATA-14

Comparing the  $\chi^2$  value (878.87) that is greater than the critical value in the  $\chi^2$  table for the probability of 0.05 and the degree of freedom of 532, which is 586.76, it specifies that the overall independent variables have a strong relationship with the dependent variable. This conclusion is supported by the P value of 0.0000, that is less than the significance level of 0.05, implying also that the overall independent variables statistically significant

correlate with the dependent variable. The  $R^2$  value of 0.6225 or 62.25% indicates that the overall factors in the CMM framework could explain more than 62% of Indonesia's inward FDI in 2005-2017.

Since the CMM framework and its variables fit to predict the FDI inflows in Indonesia, the SUR results are applicable to examine the correlation between individual independent variables and the inward FDI. Under a significance level of 0.05, Table 3 shows that FDI has a correlation with TGDPDIFSQ, TSKDIFF\*GDPDIFF, SKDIFF2\*MPOR, and TMPOR, either in a positive or negative way. On the other hand, FDI is not significantly related to TSUMGDP, SKDIFF, TXPOR, and TREATY0. As the study focuses on the impact of DTTs on FDI, the study will not expose the correlation between other variables and FDI. In this case, since TREATY0 represents DTTs that are in force in the same year as the inward FDI, the results conclude that DTTs do not reveal any robust effect on the inward FDI immediately.

Table 4. Seemingly unrelated regression results of TREATY3

Equation	Obs.	Parms	RMSE	"R-sq"	chi2	P
FDI	533	8	638692.1	0.6225	878.87	0.0000
	Coef.	Std. Err.	Z	P> z	[95% Conf. Interval]	
TSUMGDP	1.48e+08	1.34e+08	1.11	0.267	-1.14e+08	4.10e+08
TGDPDIFSQ	-46.66511	13.85117	-3.37	0.001	-73.81291	-19.5173
SKDIFF	-1061220	640172	-1.66	0.097	-2,315,934	193,494
TSKDIFF*GDPDIFF	6.03e+07	2.54e+07	2.38	0.017	1.06e+07	1.10e+08
SKDIFF2*MPOR	3.287039	.2216954	14.83	0.000	2.852524	3.721554
TMPOR	155.4298	48.19353	3.23	0.001	60.97222	249.8874
TXPOR	1,555,571	3,817,637	0.41	0.684	-5,926,860	9,038,001
TREATY3	-1,698.053	74,400.21	-0.02	0.982	-147,519.8	144,123.7
_cons	13,813.39	232,215	0.06	0.953	-441,319.7	468,946.5

Source: Extract from STATA-14

When the study is expanded to examine the impact of the Indonesia DTTs network on the inward FDI in a medium term (three years after implementation), the SUR results are shown in Table 4. The results remain the same that FDI has a correlation with TGDPDIFSQ, TSKDIFF\*GDPDIFF, SKDIFF2\*MPOR, and TMPOR, but does not have any relationship with TSUMGDP, SKDIFF, TXPOR, and TREATY3.

Table 5. Seemingly unrelated regression results of TREATY6

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
FDI	533	8	638,599.4	0.6226	879.28	0.0000
	Coef.	Std. Err.	Z	P> z	[95% Conf. Interval]	
TSUMGDP	1.36e+08	1.34e+08	1.02	0.308	-1.26e+08	3.98e+08
TGDPDIFSQ	-47.40509	13.84118	-3.42	0.001	-74.5333	-20.27688
SKDIFF	-1,003,968	649,068.6	-1.55	0.122	-2,276,119	268,183.4
TSKDIFF*GDPDIFF	6.05e+07	2.54e+07	2.38	0.017	1.07e+07	1.10e+08
SKDIFF2*MPOR	3.280324	.22151	14.81	0.000	2.846172	3.714475
TMPOR	158.5793	48.12604	3.30	0.001	64.25397	252.9046
TXPOR	1,237,451	3,800,721	0.33	0.745	-6,211,825	8,686,727
TREATY6	-28619.85	72,651.62	-0.39	0.694	-171,014.4	113,774.7
_cons	31,944.77	229,063.9	0.14	0.889	-417,012.2	480,901.7

Source: Extract from STATA-14

Similar results also occur when the study examines the impact of the Indonesia DTTs network on the inward FDI in a long term (six years after implementation). The SUR results are presented in Table 5. The results describe that FDI has a correlation with TGDPDIFSQ, TSKDIFF\*GDPDIFF, SKDIFF2\*MPOR, and TMPOR, but does not have any relationship with TSUMGDP, SKDIFF, TXPOR, and TREATY6. In conclusion, the Indonesia DTTs network does not have any impact on the inward FDI in the medium and long term as well.

### 3.3. Discussion on the results of capability maturity model (CMM) framework analysis

The results of the quantitative analysis above reveal that the Indonesia DTTs network does not have any impact on the inward FDI in the short, medium, and long term. This finding is then followed up by an investigation to discover the causes of why the Indonesia DTTs network has no relationship with the inward FDI. This second phase of the study is conducted in a qualitative method involving literature reviews, focus group discussions, in-depth interviews, and observations.

The literature reviews find that the significant factors or determinants of FDI in Indonesia are economic growth, labor costs, infrastructure, exchange rates, and political stability. Compared with other determinants, economic growth is the most important factor in encouraging investment in Indonesia. The infrastructure and political stability have a significant impact on the inward FDI. Development of infrastructure, especially for roads and communication, attracts FDI by promoting efficiencies in production and business activities. The role of political stability in attracting investment in Indonesia is in line with Dunning's theory that investors see the risks that exist within a country. The literature reviews find also that Indonesia's bilateral agreement is not a significant determinant of FDI in Indonesia, while Asia countries' bilateral agreements are ones of the determinants of FDI in Asia (Kurniati *et al.* 2007, Darmawan *et al.* 2013, Soekro *et al.* 2015).

The focus group discussions, interviews, and observations reveal that most of Indonesia's DTTs were concluded as a response to other countries' proposals and often for more political than economic reasons. With this kind of motivation, it is understandable not to expect any economic impact of the implementation of the DTTs. For example, Indonesia has concluded DTTs with North Korea, Mongolia, Romania, Tunisia, and Venezuela; however, in the period of the study, there were no records of FDI inflows to Indonesia from those countries.

It was also discussed that the key determinant in the decision-making process to invest abroad are location advantages of the host country and the government economic policy objectives, including both tax factors and non-tax factors. The non-tax factors are considered more essential than the tax factors. Countries with political and economic stability, reliable regulatory framework, credible workforce, and other advantages are much more likely to attract foreign investment. It is commonly recognized that the most obvious advantages of Indonesia are its market size and natural resources. Therefore, it is suspected that the motivations of FDI in Indonesia are mainly to serve the market and seek the inputs of natural resources.

DTTs alone, as a part of tax factors, will not ensure increased FDI if the underlying legal certainty, political stability, and economic infrastructure do not effectively support such investment. DTTs do not necessarily attract FDI, but rather remove obstacles and distortions to cross-border trade and investment. When the risk of double taxation is considered as a significant factor of FDI activity, DTTs will play a meaningful role to promote FDI. Investors may also need a DTT to be able to receive a foreign tax credit or an exemption for foreign source income because DTTs harmonize source of income rules and set an obligation to eliminate double taxation. In this case, the conclusion that the Indonesia DTTs network does not have any impact on the inward FDI implies that double taxation is not the main issue of FDI activity in Indonesia.

### Conclusions and recommendations

This study focuses on better understanding the functioning of the Indonesia DTTs network by examining its effect on the FDI inflows in Indonesia and investigating the causes of whether or not it has an effect. This understanding is essential to Indonesia to provide the basis for evaluating the DTTs network and its treaty policy.

This study finds that the Indonesia DTTs network does not have any impact on the inward FDI in a short, medium, and long term. This finding will be an important policy consideration since Indonesia has a large number of DTTs in force and Indonesia is an attractive investment destination, but the DTTs network does not have any correlation with the inward FDI.

The causes of why the Indonesia DTTs network did not play a significant role in promoting FDI were identified as follows. First, in the case of Indonesia, the determinants of FDI do not involve DTTs or other bilateral agreements. Foreign investors more consider the non-tax factors than the tax factors in Indonesia to place their investment. Since Indonesia is considered as an attractive investment destination, this may indicate that the foreign investors are satisfied with the non-tax factors so that they locate their investment in Indonesia. Secondly, most of Indonesia's DTTs were concluded for political reasons. It implies that the Indonesia DTTs network was not specifically intended to attract FDI.

Based on this study, it is suggested that Indonesia needs to review its treaty policy, or at least to revisit the objective of its treaty policy. If the DTTs network is intended to support the investment attractiveness, further study is recommended to review DTTs individually to optimize its benefits. If the DTTs network merely functions as a political or diplomatic instrument, the review is suggested to control the costs that arise from having DTTs, including tax revenue forgone.

It is understood that Indonesia, as a G20 country and a key partner of OECD, cannot avoid its involvement in the global DTTs network and its consequence of "fees" to become a member of the "treaty club". In this regard, Indonesia may preserve its taxing rights as much as possible to minimize the tax revenue forgone in negotiating DTTs, thus reducing the "membership fees".

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## Is There Any Theory that Explains the Swedish Krona (SEK)?

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### Abstract:

This paper investigates if the value of the Swedish krona (SEK) against the US dollar (\$) and the Euro (€) can be explained by some standard theories and fundamentals, such as the purchasing power parity, the interest rate parity, the debt-ratio and the trade balance ratio, using monthly data since February, 1993. All of them fail to explain why the SEK is so "weak". The lower inflation rate in Sweden over the recent years has not strengthened the currency. Similarly, the theoretically stronger SEK implied by the lower interest rates in Sweden as the uncovered interest rate parity predicts, has not emerged yet. Finally, neither the persistent trade balance surpluses, nor the declining and very low debt ratio in Sweden has had any positive effects on the currency. It seems that the traders and investors ignore the fundamentals, speculate against the currency and keep it undervalued. Moreover, a number of simulated paths, predicted from various ARIMA-processes, based on the historic exchange rates, show that the worse exchange rates have already gone and by the end of 2020 the \$ and the € will cost around 8 and 9.8 SEK respectively.

**Keywords:** exchange rate; interest rate parity; purchasing power parity; forecasting.

**JEL Classification:** F31; F33; F34; F41.

### Introduction

Various researchers have proposed a large number of fundamental factors to explain a currency path or different exchange rates. Among them, Patel *et al.* (2014) have mentioned the following: inflation differentials, interest rate differentials, trade balance, debt, budget deficit, speculation, expectations, GDP, unit labor costs, productivity and political stability. In addition to those factors, they mention various prediction models, such as random walk, artificial neural network, feed forward neural network, standard backpropagation, scaled conjugate gradient, and backpropagation with Bayesian regularization.

Most of the empirical studies have examined the first two factors, i.e. to what extent the absolute and relative Purchasing Power Parity (PPP) and the Uncovered Interest Rate Parity (UIP) can explain various exchange rates; good surveys appear in Cheung *et al.* (2005), Husted and Melvin (2013), Feenstra and Taylor (2016). The majority of the referred studies reject both theories. Notice also that some studies find opposite effects, i.e. instead of expected currency appreciation that the theories predict, the currency under investigation depreciated.

The following factors explain why the PPP performs badly: PPP fits better in the long run; not all goods are traded internationally; productivity differentials between traded and non-traded goods exist; often there exist high transport costs; there are various barriers to trade or preferential agreements and imperfect competition; there are different adjustment speeds between capital and goods markets.

With regard to UIP theory, various models attempt to explain its unsatisfactory or contradictory prediction. For instance, in monetary models of exchange rate determination, one relies on the assumption that the PPP holds and prices are flexible. Thus, the effects of expansive monetary will lead to inflation, and consequently to depreciation, despite the fact that the UIP theory would predict appreciation, due to lower interest rates from the expansive monetary policy.

Similarly, in the sticky prices model of Dornbusch (1976), an expansive monetary policy will reduce the interest rate immediately, leading to a much larger depreciation (overshooting), despite the fact that the domestic prices will increase gradually, but later. The violation of PPP in the short run will disappear in the long run when both prices and interest rate will increase, leading to a strengthening of the currency.

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In the portfolio balance model, the overshooting will improve the current account considerably, leading to a gradual appreciation of the currency. Moreover, the appreciation of the currency will subsequently eliminate the surplus. In that model, various risk preferences for foreign or domestic bonds can be consistent with appreciation (depreciation) of the currency and lower (higher) domestic interest rates.

In fact, some empirical studies show that the flexible-price monetary model, the sticky-price portfolio model and the real interest differential model (or the UIP model) perform even worse compared to the simple random walk model. Other studies attempt to model exchange-rate expectations. Exchange rate forecasting is one of the most demanding predictions central institutions make to plan their monetary policies. It is therefore not surprising that this activity attracts a lot of public attention. Good exchange rate forecasts are not only desirable, but also important for correct policy formulation and future adjustments. Often, exchange rate forecasting is based on advanced time series models. There exist also other approaches to predict the accuracy of the models. For instance, the forward rate in UIP assumes that expectations are rational, with perfect foresight and nonexistent risk premium. However, expectations are not easily observed, they vary over time and might be extrapolative and regressive as well.

In this paper I will test to what extent the relative PPP, the UIP, the trade balance ratio and the debt-ratio can explain the SEK/\$ and the SEK/€ exchange rates, over the last 26 years, based on a 312 months period (Feb 1993 - Jan 2019)<sup>2</sup>. The PPP and the UIP hypotheses will be tested with standard least and non-linear least squares, as well as with modern methods, such as Random Forest, Nearest Neighbors, Neural Network and Gaussian. The paper is organized as follows: section 2 presents a very short history of the SEK; in section 3 and 4 the PPP and UIP are tested for SEK against \$ and €; in section 5 both theories, as well as the Fisher effect is tested; the trade balance ratio and the debt-ratio is tested in section 6; section 7 shows some simulations to predict the SEK path over the next two years, while section 8 concludes the paper.

## 1. A very short history of Swedish krona (SEK)

The Swedish krona (SEK) participated in the Bretton Woods system since 1950. The value of \$ was fixed at 5.17 SEK, which was equivalent to 5.82 SEK per gram of gold. It kept its fixed rate until the system collapsed. In 1973 it joined the fixed exchange rates system "European band" or "snake". In August 1977 Sweden withdrew its SEK from the system, devalued the currency by 9% against the Deutschmark and pegged it in a new basket of currencies, where the \$ had the largest weight. In September 1981 it was devalued by 10% and in October 1982 by additional 16%. These devaluations were mainly due to higher inflation in Sweden.

After the last devaluation, it was meant that the Central Bank (Riksbank) should keep the currency stable. In May 1991, the currency was linked to ECU, despite the fact that Sweden was not a member of the EU. The central exchange rate against the ECU was set at 7.49 SEK. In addition to that, Sweden chose the narrow deviation (+/- 2.25%) from the central rate. In September 1992 the speculative attacks against many currencies in ECU, affected also the SEK. The country's inflation was above its competitors and huge capital outflows made it difficult to keep the central rate against the ECU. When the Riksbank failed to support the exchange rate, despite the extensive use of its international reserves, the last weapon in its arsenal was the interest rate and increased it to 500%! The attacks against SEK continued when the interest rate was reduced to about 40%, and two months later (November 1992) the fixed exchange rate regime was abandoned. The date it was announced, the SEK depreciated immediately by about 26%.

The flexible exchange rate regime has been in force over twenty-seven years. The Riksbank has no mandate to stabilize the currency anymore. Its key objective has shifted towards keeping the rate of inflation at 2%, mainly through its key interest rate. As expected, the value of flexible SEK did not remain "stable". It has been very volatile and overall much weaker against the main currencies. For instance, just after the Lehman crash, the € was valued at almost 11.50 SEK and in May 2019 about 10.8, *i.e.* the SEK depreciated by more than 40% compared to central course 7.49 SEK against its predecessor, ECU. Over the recent years many analysts and observers criticized the Riksbank for its over-aggressive monetary policy (by keeping its key interest rate negative over the recent years) in order to lift the rate of inflation towards its target.

## 2. Swedish krona and Purchasing Power Parity (PPP) theory

As is known, PPP refers to the idea that the same good should be priced equally in both countries and is often called as the law of one price. If for instance a Volvo costs 400,000 SEK in Sweden and 40,000 € in France, *ceteris*

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<sup>2</sup> All data are collected from [www.ekonomifakta.se/Fakta/Ekonomi](http://www.ekonomifakta.se/Fakta/Ekonomi)

paribus, it implies that 1 € is worth 10 SEK. If for instance, the nominal exchange rate is 10 SEK/€<sup>3</sup>, the real exchange rate is equal to 1, *i.e.*  $40,000 \text{ €} \cdot 10 \text{ SEK/€} = 400,000 \text{ SEK}$ .

If the nominal exchange rate remains at 10SEK/€ but the price of Volvo in France decreases to 39,000€ (=390,000SEK), the real exchange rate deviates from 1 and turns out to be  $39,000\text{€} \cdot 10 \text{ SEK/€} / 400,000 = 0.975$ , indicating that Volvo is cheaper in France by about 2.56%. A Swede who plans to buy the car will buy it in France cheaper by 1,000€, if the nominal exchange rate remains at 10SEK/€. In fact, the car will not be cheaper in France because the nominal exchange rate should change to 10.2565 SEK/€, *i.e.*  $39,000\text{€} \cdot 10.2565 \text{ SEK/€} = 400,000 \text{ SEK}$ . Similarly, if the SEK depreciates by 5%, and the car is still priced at 400,000 in Sweden, a French citizen needs to pay 38,095 € to buy the car (*i.e.* it is like if Volvo reduces its price in France to that amount).

## 2.1. The exchange rates

Figure 1 shows the monthly exchange rates levels (SEK/€ & SEK/\$) over the period February, 1993 – January, 2019. It is clear that both series<sup>4</sup>, and especially the SEK/\$, are very volatile.

Figure 1. Monthly exchange rates: 1993-2019



Source: [www.ekonomifakta.se/Fakta/Ekonomi](http://www.ekonomifakta.se/Fakta/Ekonomi)

None of the series is normally distributed. The normality hypothesis for both exchange rates is rejected at the 5% level, based on the Cramér-von Mises test. In fact, the three best distributions estimated in Mathematica are various combinations of normal and log-normal, as well as extreme value distributions. For instance the extreme value distribution of SEK/€, has a mean value<sup>5</sup> of 9.23, while the extreme value distribution of SEK/\$ has a mean value of 7.78. (In Appendix A, you can see the oscillating mean, the noisy volatility and the unstable skewness, kurtosis and other measures as well, of both exchange rates levels, their histograms, and the three best Kernel estimated distributions).

Not only are the series non-normal, they are also non-stationary. The Dickey-Fuller stationarity tests do not reject the existence of unit roots at 5% (or even lower) levels. Due to non-stationarity in exchange rates, the regressions can spuriously show a significant effect of the explanatory variables that might not be true, *i.e.* yielding incorrect t-statistics in estimates.

A simple method to make the series stationary is to take the differences in logarithms, such as month to month in the same year, quarter to quarter in the same year, or month to month for subsequent years. The three respective processes estimated by Mathematica for the SEK/\$ are: *GARCH (1,1)*, *ARMA (1,2)* and *ARMA (1,1)*. Similarly, the three respective processes for SEK/€ are: *GARCH (1,1)*, *ARMA (2,2)* and *AR (1)*. The Dickey-Fuller tests do reject the existence of unit roots in these cases. Figure 2 shows the stationary annual changes in exchange

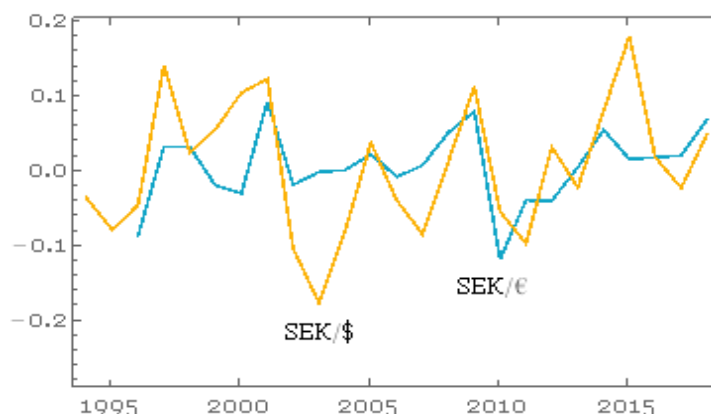
<sup>3</sup> In this paper the nominal exchange rate is defined as domestic-currency (SEK) per foreign-currency (\$, or €), *i.e.* ( $E = P_{\text{Swe}}/P_{\text{EU}}$ , respectively  $E = P_{\text{Swe}}/P_{\text{US}}$ ), indicating that higher (lower) values in  $E$  implying depreciation (appreciation) of the domestic currency when the domestic prices are higher (lower). Similarly, the real exchange rate is defined as  $E_R = E P_{\text{for}}/P$ , indicating that, values below (above) 1 imply depreciation (appreciation) of the domestic currency.

<sup>4</sup> The Euro was introduced in January 1, 1999. Prior to 1999 the SEK/€ refers to its predecessor, ECU, *i.e.* it is based on the theoretical weights of the EU countries' currencies.

<sup>5</sup> The mean value of the extreme value distribution is given by:  $\alpha + \text{EulerGamma} \beta$ , where  $\alpha$  is a location parameter and  $\beta$  is a scale parameter (see Mathematica).

rate. Notice that the SEK/€ is two years shorter<sup>6</sup> (1996 - 2018). Positive values show annual rates of depreciation of SEK. It is clear that SEK started to depreciate about seven years ago and its weakening continues until now (May 2019).

Figure 2. Annual changes in exchange rates (SEK/€ & SEK/\$)



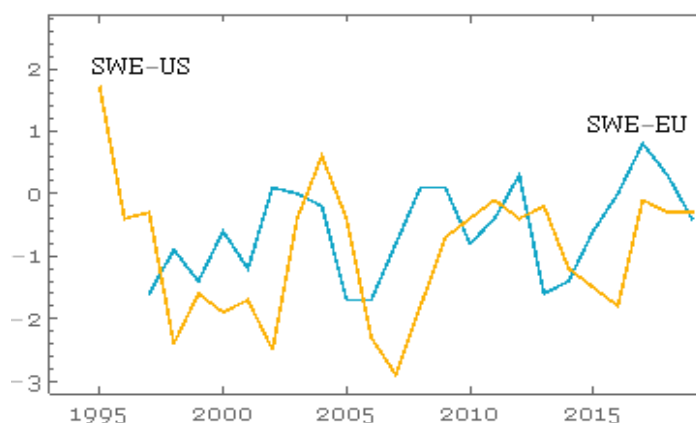
Source: own calculations

Moreover, despite the fact that the changes of SEK/\$ and SEK/€ are stationary, they are not normally distributed (see Appendix B). The non-normality is confirmed when we compare the histogram to fitted smooth kernel normal distribution. The SEK/\$ for instance has two peaks, and fatter tails point out at non-normal patterns. In Appendix B, you can also see their means and standard deviations.

## 2.2 The inflation differentials

The inflation differentials between Sweden & US, respectively Sweden & EU, over the same period are shown in Figure 3. Both inflation differentials series are weakly stationary, the SWE - EU is MA (1) while the SWE - US is AR (1). The average inflation differential over the investigated period was slightly lower in Sweden, by about -0.6 %, compared to the US and EU.

Figure 3. Annual inflation differentials



Source: own calculations

Since both explained (exchange rate changes) and explanatory variables (inflation changes) are stationary, the OLS estimates will be unbiased.

The relative PPP regression to be tested is given by equation (1):

$$\Delta \text{Log}[E] = \alpha_1 + \alpha_2(\Delta \text{Log}[P] - \Delta \text{Log}[P^*]) + u_t \quad (1)$$

where:  $\Delta \text{Log}[E]$  = annual change of SEK/\$, resp. SEK/€,

<sup>6</sup> Prior to 1996, some countries that did not meet the Maastricht criteria. For instance, not all countries were meeting the inflation limits and the average inflation in EU was very volatile. Since the PPP theory relates inflation differences to exchange rates differences, the SEK/€ starts two years later than the SEK/\$.

$\Delta \text{Log}[P] - \Delta \text{Log}[P^*]$   
 = annual inflation changes between Sweden and US, respectively Euroland  
 and  $u_t \sim N(0, \sigma^2)$

If PPP holds,  $\alpha_1 = 0$  &  $\alpha_2 = 1$ , i.e. higher inflation in Sweden will increase the exchange rate (i.e. the SEK will depreciate against the respective currency)<sup>7</sup>.

Both Linear (LS) and Non-linear least squares (NLS) were applied. Since LS minimize the sum of squares of correlated errors, the NLS that minimize the sum of non-correlated errors is to be preferred (Hill *et al.* 2008). Moreover, both methods yield almost identical estimates.

The NLS estimates are given in Table 1. It is clear that the relative PPP hypothesis  $\alpha_2 = 1$  is rejected for both exchange rates. In fact, for SEK/\$,  $\alpha_2 = -1$ , i.e. the SEK has depreciated against the \$ because of lower inflation in Sweden! According to these estimates, it would appreciate by about 7% if the Swedish inflation were 1% higher than the US! Similarly, the Swedish inflation needs to be 1% lower than the EU for the SEK/€ to remain stable.

Table 1. Regression estimates of purchasing power parity (PPP)

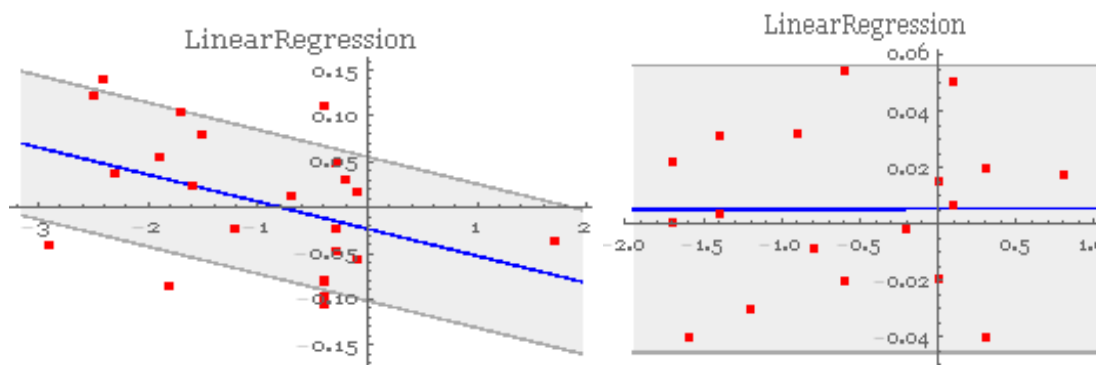
$\Delta \text{Log}[E]$	$a_1$	$a_2$	$R^2$	DW
SEK/\$	-0.0342 (1.65)	-0.0414* (2.83)	0.26	1.40
SEK/€	0.0133 (0.99)	0.0136 (0.95)	0.04	1.95

Note: t-stat in parenthesis; (\*) denote 0.05 significance level.

Source: own calculations

The  $R^2$ -values are low, while the Durbin-Watson values indicate no clear autocorrelation for the SEK/\$ and absence of autocorrelation for the SEK/€. The regression equations are shown on Figure 3. The residuals satisfy the assumption  $u_t \sim N(0, \sigma^2)$ , because the null hypothesis that they are normally distributed is not rejected at the 5% level based on the Kolmogorov-Smirnov test. All pair of points, identified by the respective year, are shown as a bubble charts in Appendix C.

Figure 3. Regression lines of Purchasing Power Parity (SEK/\$ left, SEK/€ right)



Source: own calculations

From the SEK/€ graphs one can observe that, despite the fact that the Swedish inflation was lower than the EU inflation over 15 out of 23 years, the SEK is not stronger. For instance, the recent negative inflation difference is identical to 2011. Moreover, the recent SEK depreciation (May 2019) is about 7% while in 2011 the SEK appreciated by about 11%.

In addition to NLS, I applied four modern methods from Mathematica; Gaussian Process, Nearest Neighbors, Random Forest and Neural Network. All graphs are found in Appendix D. None of them supports the relative PPP. On the contrary, the last three seem to reveal that a lower Swedish inflation leads to a depreciated SEK against the \$, precisely as the NLS above. Thus, the SEK is undervalued against the \$ according to the relative PPP. Similarly, these methods show that SEK is undervalued against the € too.

<sup>7</sup> The hypothesis  $\alpha_2 = 1$  is an ideal relationship of the relative PPP and is rather impossible to achieve it at least in the short run. Thus, it is sufficient to show that  $\alpha_2 > 0$ , if the pairs of exchange rate and inflation differences do not necessarily lie on a 45° line.

### 3. Swedish krona and interest rate parity (IRP) theory

While the PPP is a long run equilibrium exchange rate, the Interest Rate Parity (IRP) is based on asset market models and attempts to analyze movements in exchange rates over the short run. According to IRP, the exchange rate between two countries will reflect the differences in the respective interest rates. There are two variants of IRP, the Uncovered and the Covered.

Assume a US investor who buys SEK (with USA = domestic country and Sweden = foreign country). Assume that the spot exchange rate is  $S = 0.1\$/\text{SEK}$  in New York (or  $10\text{SEK}/\text{\$}$  in Stockholm). Assume also that the annual interest rates are  $r_{\text{SW}} = 0.01$ , respectively  $r_{\text{US}} = 0.025$ . If there are no other risk-premia or preferences towards  $\text{\$}$  or SEK, one can estimate the arbitrage free future spot of SEK (forward) in terms of  $\text{\$}$  (or  $\text{\$}$  forward in terms of SEK).

The estimation is based on the following strategy (in  $\text{\$}$ ):

- Borrow SEK 1 M and pay back next year SEK 1.01 M
- Exchange SEK 1 M to 0.1 $\text{\$}$  and save it in the US  
and simultaneously,
- Sell the  $\text{\$}$  forward at (F) and buy SEK to pay back your loan in SEK.

The US investor will receive in a year (in US):  $0.1 \cdot (1.025) = \$ 0.1025 \text{ M}$ . Without arbitrage profit,  $102,500 \$ = 1,010,000 \text{ SEK}$ , i.e. approximately  $F = 0.1015\$/\text{SEK}$ , or  $9.5375\text{SEK}/\text{\$}$ . This implies that the  $\text{\$}$  in Sweden is expected to fall from  $10\text{SEK}/\text{\$}$  to  $9.5375\text{SEK}/\text{\$}$ , or the SEK in the US to increase from  $0.1\$/\text{SEK}$  to  $0.1015\$/\text{SEK}$ . Thus, at equilibrium the following relationship must hold, in the domestic country, USA:

$$F = \frac{(1+r_{\text{US}})}{(1+r_{\text{SW}})} S \quad (2)$$

Equation (2) is the well-known *covered interest rate parity* (CIP).

Therefore, if  $r_{\text{SW}} < r_{\text{US}}$ , the SEK will be stronger in the future ( $F > S$ ). If on the other hand,  $F < S$ , (i.e. the SEK is expected to weaken in the future), a stronger SEK now will be consistent only if  $r_{\text{SW}} > r_{\text{US}}$ . This equilibrium condition applies to changes in interest rates as well. For instance, if the US increase its interest rate to 0.03 (or if Sweden decreases its own rate to 0.005), the spot exchange rate will change as well (i.e. the SEK will depreciate, perhaps from  $10 \text{ SEK}/\text{\$}$  to  $10.25 \text{ SEK}/\text{\$}$ ) and consequently the forward rate will change too.

Moreover, the UIP cannot be tested, since the market expectations of the future exchange rate are not observed. Some investors expect the forward rate to be at premium, while others to be at discount, and many might disregard c) in the above strategy. In that case the expected exchange rate in the future will be different from  $F = 0.1015\$/\text{SEK}$ , and the interest rate parity will then be *uncovered* (UIP), or risky. For instance, the US investor who invests in the US will experience losses, if the SEK gets stronger than  $0.1015\$/\text{SEK}$ . If the exchange rate in New York is higher than  $0.11\$/\text{SEK}$ , its savings in the US are lower than needed to pay back its loan in Sweden (it will have only  $102,500\text{\$}$  that will be worth  $931,818\text{SEK}$ , i.e. a loss of  $78,182\text{SEK}$  compared to  $1,010,000\text{SEK}$  the investor must pay for the loan). Similarly, the US investor will make profits if the  $\text{\$}$  gets stronger than  $0.10\$/\text{SEK}$ .

Instead of using forward exchange rates, we can assume that  $\text{Log}[F] = \text{Log}[E_{t+1}]$  and  $\text{Log}[S] = \text{Log}[E_t]$ . Thus, the UIP can be formulated as:

$$\text{Log}[E_{t+1}] - \text{Log}[E_t] = \beta_1 + \beta_2(r_t - r_t^*) + u_t \quad (3)$$

where:  $\text{Log}[E_{t+1}] - \text{Log}[E_t] = \% \text{ of SEK}/\text{\$}$ , resp.  $\text{SEK}/\text{\$}$  within a year,  $(r_t - r_t^*) =$  annual interest rates between Sweden and US, resp. Euroland at the start of year  $t$  and  $u_t \sim N(0, \sigma^2)$

Notice that, if  $\text{Log}[E_{t+1}] - \text{Log}[E_t] > 0$ , the SEK will depreciate, while if it is negative, it will appreciate.

The UIP holds if the right part side has the same sign as the left part side. For instance, if  $\beta_1 = 0$  &  $\beta_2 = 1$ , the SEK is going to depreciate (appreciate) by the same percentage<sup>8</sup>, if the Swedish interest rates are higher (lower). Similarly, if  $\beta_2 = -1$ , the SEK is also going to depreciate if  $(r_t - r_t^*) < 0$ , respectively appreciate if  $(r_t - r_t^*) > 0$ .

Many empirical studies that test if UIP holds (such as Fama (1984), Froot and Thaler (1990), Sarno (2005), Chinn (2007), Spronk *et al.* (2013), Miller (2014)) reject that the forward rate will be the true spot rate in the future. Some of them (Froot and Thaler (1990)) find a significant opposite effect (-0.88), i.e. the currency of the country that has the highest interest rates appreciates; this leads to a third option.

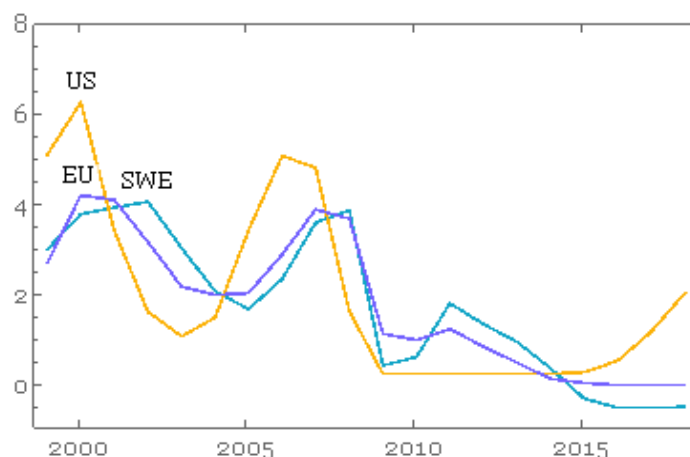
<sup>8</sup> Again, there is no need to be "by the same percentage". Moreover, if exchange rates react directly to interest rates differences, it is often argued that the pairs of exchange rate and interest rates differences should lie on a 45° line.

According to that option, *i.e.* the so-called carry trade strategy, the investors make risky (naïve) decisions and consequently speculate against SEK, which nowadays pays lower interest rates. They simply short the SEK and they do not expect it to appreciate, as the UIP would predict. When sufficiently many traders and investors share the same view in the market, the SEK will depreciate, irrespectively if the theory would predict an appreciation of the SEK.

The carry trade strategy will hold if  $\beta_1 = 0$  &  $\beta_2 = -1$ , *i.e.* the SEK is going to depreciate (appreciate), if the Swedish interest rates are lower (higher). Some studies (Frankel and Froot (1990), Galati and Melvin (2004), Burnside *et al.* (2006)) find that this simple (but risky) carry trade strategy is rather profitable.

Figure 4 shows the key interest rates (Riksbank, FED and ECB) in the three countries, over the period 1999 - 2018. All rates were almost identical around 2014, but thereafter the interest rate in Sweden turned negative, while the US increased and the Euro interest rate remained almost unchanged.

Figure 4. Key interest rates



Source: [www.ekonomifakta.se/Fakta/Ekonomi](http://www.ekonomifakta.se/Fakta/Ekonomi)

### 3.1. The estimates

As was mentioned previously, the month-to-month for subsequent years for the SEK/\$ is an *ARMA* (1,1) process while the SEK/€ is an *AR* (1) process. Also, the EU-SWE interest rate differential is an *ARMA* (1,1) process, and the US-SWE interest rate differentials is a *MA* (1) process. Since all processes are stationary<sup>9</sup>, the NLS estimates are unbiased.

The NLS estimates for both exchange rates are given in Table 2. It is clear that the UIP theory is rejected for both exchange rates (t-stat in parenthesis).  $R^2$ -values are low, there is no autocorrelation and the non-normality of residuals is not rejected.

Table 2. Regression estimates of interest rate parity (IRP)

$\text{Log}[E_{t+1}] - \text{Log}[E_t]$	$\beta_1$	$\beta_2$	$R^2$	DW
SEK/\$	0.00082 (0.04)	-0.0119 (1.76)	0.15	1.48
SEK/€	0.00654 (0.6)	-0.0245 (1.1)	0.06	2.06

Source: own calculations

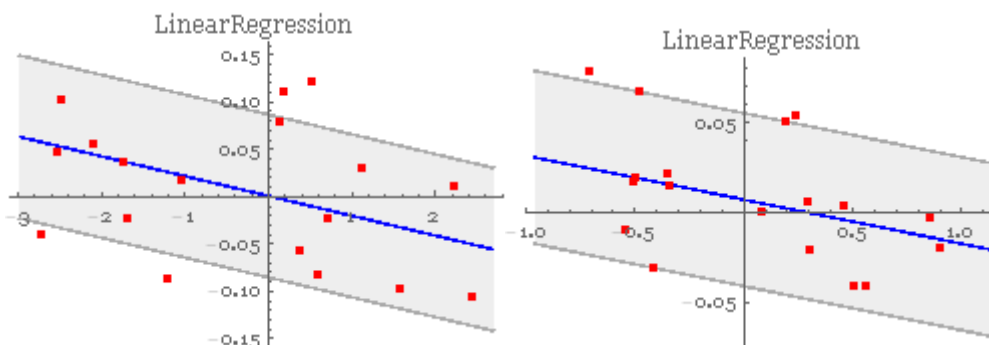
Only a very weak negative effect (at about 9% level of significance) is found for the SEK/\$, indicating a weak support for the carry trade strategy. For instance if the interest rate differential between Sweden and US is -2.5 (as it is now, May 2019), the product  $\beta_2(r_t - r_t^*) = +5.25\%$ , implying a SEK depreciation of about 5.25% (annually). Thus, those who borrowed SEK 1 M and invested their exchanged SEK into \$ in the US at 2%, would make high profits when they pay back their SEK-loans, with their appreciated \$. Similarly, given the recent interest rate differential between Sweden and EU (-0.5) the product  $-0.0245(-0.5)$  predicts less than 2% SEK depreciation, which is much lower than the recent depreciations.

<sup>9</sup> Notice that the annual interest rates in Sweden is an *ARIMA* (0, 1, 0) process but non-stationary. On the other hand, both the EU and US interest rates are *ARMA* (1,1) and stationary.



As we see on the left graph of Figure 5 (SEK/\$), out of twenty interest rates differentials (horizontally) and exchange rate changes (vertically), twelve are negatively correlated, and eight are positively correlated, showing a very weak support of the UIP. Notice though that there have been five observations (upper, right) where the SEK depreciated, despite the fact that the interest rates differences were positive. Similarly, there have been three observations (lower, left) where the SEK appreciated, even when the interest rates differences were negative.

Figure 5. Regression lines of interest rate parity (IRP) - SEK/\$ left, SEK/€ right



Source: own calculations

The additional four methods applied do not seem to clearly support the UIP (see Appendix F). The Random Forest and the Nearest Neighbors show a very weak negative effect, while the Gaussian and Neural Network show unclear effects. In fact, the non-linearity is apparent in the Neural Network, where interest rates differences of about -1.5% units, or positive, seem to strengthen the SEK against \$. Larger percentage units than -1.5 and differences between -1.5 & 0 seem to weaken it. That applies to SEK/€ as well.

Finally, in addition to annual interest rates differences, I repeated the regressions with both 240 monthly and 60 quarterly (Feb 1999 - Jan 2019) observations. Neither the intercept, nor the slope were different from zero (see Appendix E).

Thus, the standard argument by many analysts, namely that the Swedish Riksbank is responsible for the weak SEK, by keeping its key interest rate negative (or widening the negative interest rate differential between Sweden and US, respectively EU), does not hold. That argument seems to be valid over the recent three to four years, while similar negative interest rates differences a few years earlier did not weaken the SEK that time. The support for the alternative carry trade strategy is very weak (for the SEK/\$) and is rejected for the SEK/€. Remember though that this strategy is naïve and might have worked over the recent years. Moreover, a sudden strengthening of SEK will force the investors (speculators) to abandon that risky strategy and start covering their positions as implied by the CIP.

#### 4. Purchasing power parity (PPP) and interest rate parity (IRP) combined

So far, I have used nominal interest rates. Investors might be interested in the real interest rate differentials that can affect the exchange rate either through the IRP, or the carry trade mentioned above. Consequently, if PPP and IRP hold, the real interest rates should be equal across countries.

A variant of real interest rates is credited to Irving Fisher, so that a rise in the expected inflation rate in one country will lead to a rise in its nominal interest rate, *i.e.*  $(r_t - r^*_t) = (P_t - P^*_t)$ . Is that true between Sweden and US respectively €?

To test the Fisher effect, the following simple regression, equation 4, was used:

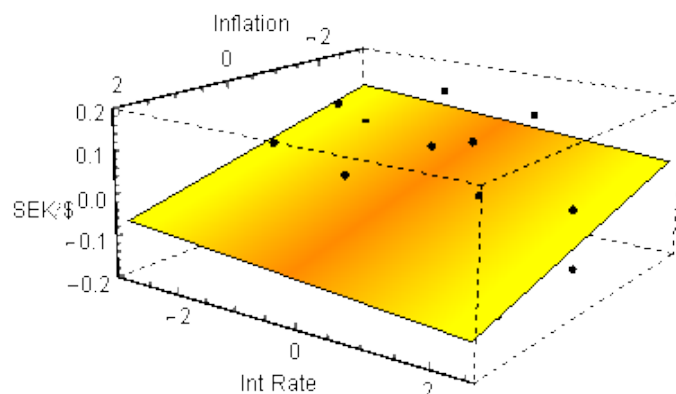
$$(r_t - r^*_t) = \gamma_1 + \gamma_2(P_t - P^*_t) + u_t \quad (4)$$

For instance, if  $\gamma_1 = 0$  &  $\gamma_2 > 0$ , or optimally  $\gamma_2 = 1$ , the Fisher effect exists.

Simple regressions show that the Fisher effect between Sweden and US is not rejected. The slope  $\gamma_2 = 0.87$  and is significant from zero at the 5% level, with an  $R^2 = 0.27$ . On the other hand, there is no Fisher effect between Sweden and EU (the slope is negative but not significant from zero and  $R^2$  almost zero).

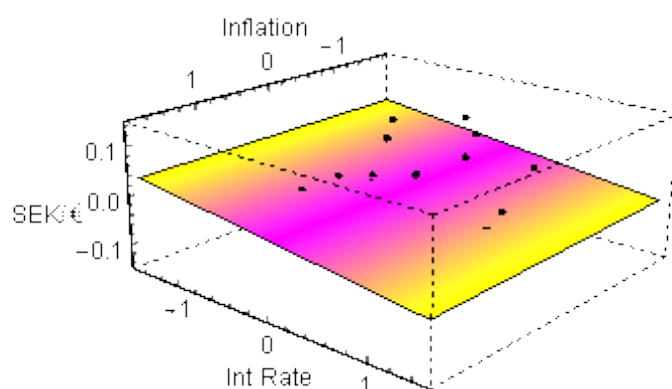
An alternative method is to test if the real exchange rates  $E_R = \frac{E P^*}{P}$ , differ. Instead of testing, I tested if both PPP (inflation differences =  $\Delta I$ ) and IRP (interest rates differences,  $\Delta R$ ) can explain the changes in SEK/\$, respectively SEK/€. The estimates were very poor and non-significant. The three-dimensional graphs, Figure 6 and 7, show almost horizontal planes (*i.e.* no changes in exchange rates are explained by PPP and IRP). About half of the observations are visible while the remaining are below the surface and are invisible.

Figure 6. Regression planes of PPP, UIP and SEK/\$



Source: own calculations

Figure 7. Regression planes of PPP, UIP and SEK/€



Source: own calculations

## 5. Other factors

Neither the inflation differentials, nor the interest rate differentials hypotheses seem to explain why the SEK is so weak against the \$ and €. The PPP is clearly rejected (in fact the reverse effect was not rejected against the \$). Even the IRP is rejected against the € and almost rejected against the \$.

Can other factors, such as trade balance and current account, or budget deficit and debt-ratio explain the weakening of SEK?

### 5.1. The trade balance

There is a huge empirical literature that investigates if the exchange rate depreciation improves the trade balance, generally over time, *i.e.* if the J-curve exists. Wang (1993), Marwah and Klein (1996), Shirvani and Wilbratte (1997), Gupta-Kapoor and Ramakrishnan (1999), Bahmani-Oskooee and Goswami (2003), Arora *et al.* (2003), Ghosh *et al.* (2008), show that the real exchange rate depreciation improves trade and confirmed the J-curve. According to Suranjali Tandon (2014), a depreciation of the real exchange rate improves trade balance for some countries, like Italy and France in Europe, as well as for Brazil, Mexico and the Philippines. On the other hand, the trade balance in other European countries, China and Malaysia is not affected, while for the UK, Japan and Singapore an appreciation of the real exchange rate improves their trade balance. Other studies, Rose and Yellen (1989), Rose (1991), Rodrik (1994) and Elbadawi (1998) found no relationship between trade and exchange rate; Bahmani-Oskooee and Brooks (1999), Wilson (2001), Baharumshah (2001), found no evidence for the J-curve. Finally, other studies, Cushman (1983), Thursby and Thursby (1987), Arslan and van Wijnbergen (1993), Chowdhury (1993), Arize *et al.* (2000), Mohamad and Nair (2009) found that exchange rate volatility depresses the volume of exports.

Normally, a country with trade surplus like Sweden<sup>10</sup>, will accumulate foreign currency. When the holdings of foreign money, relative to domestic money, increase, the foreign currency will depreciate (or the domestic

<sup>10</sup> Since 1982, Sweden has always achieved a trade balance surplus. Against the US and most European countries, Sweden had surplus in 2018. The largest deficit was against Germany (-108 billion SEK), the Netherlands (-54 billion SEK) and the Czech Republic (-10 billion SEK).

currency appreciate). Sweden has experienced surpluses in both trade balance and current account since early 90ies. For instance, the trade surplus has never been below 2% of its GDP and during 1995-2007, it was around 7-8%. Similarly, the current account has never been lower than 2% of its GDP, and over a 12-year period (1999-2011), was above than 5%. The last figures for the current account are from 2017, placing Sweden above China (with +3.2% of its GDP, versus 1.3% for China) and the US with -2.4%.

Since we are interested in explaining the exchange rate in Sweden, contrary to all studies mentioned above that used that, as a determinant of trade balance, in this study the trade balance ratio to GDP (TB) will be treated as a determinant of exchange rate. Below there are some regression estimates between TB and exchange rates (E), both in levels ( $E_t = \beta_1 + \beta_2(TB) + u_t$ ) and in changes ( $\text{Log}[E_{t+1}] - \text{Log}[E_t] = \beta_1 + \beta_2 \text{Log}[TB] + u_t$ ), annually. It is expected that  $\beta_2 < 0$ , i.e. if the trade balance improves, the exchange rate will decrease (i.e. the SEK is going to appreciate).

The estimates are shown in Table 3. For SEK/\$ they are very poor, because the trade balance ratio has no effect on the exchange rate (nether for the level nor for its changes). On the other hand, for the SEK/€ level,  $\beta_2 = -0.1023$  (significant at 0.05), i.e. the SEK would appreciate. For instance, with an actual trade balance ratio of 3%, and given the strongly significant intercept of 9.79, the exchange rate should be about 9.50SEK/€, i.e. at least 1 SEK lower compared to May 2019. For the SEK/€ changes though, the estimates are also poor.

Table 3. Regression estimates between trade balance and exchange rates

	$E_t$	$\beta_1$	$\beta_2$	R <sup>2</sup>	n
Level	SEK/\$	7.43** (13.2)	0.061 (0.64)	0.016	26
Change	SEK/\$	0.0026 (0.14)	-0.055 (0.42)	0.008	25
Level	SEK/€	9.79** (36.4)	-0.1023* (2.31)	0.19	24
Change	SEK/€	0.002 (0.18)	-0.053 (0.53)	0.013	23

Note: t-stat in parenthesis; (\*\*, \*) denote 0.01, respectively 0.05 significance level

Source: own calculations

## 5.2. The debt ratio

The empirical literature between public debt and exchange rates is rather consistent. McMillin and Koray (1990) found that shocks in the US debt lead to a short-lived depreciation of the US dollar. Devereux and Lane (2001) found that exchange rate depreciation increases foreign borrowing through nominal and real interest rate. Fida *et al.* (2012) found that increase in external debt depreciates the real exchange rate in Pakistan. Alam and Taib (2013) found that external debt is related to the exchange rate depreciation, which is more significant in debt trap countries (India, Indonesia, Nepal, Pakistan, Sri Lanka and Thailand) than in non-debt trap countries (Bangladesh, Fiji, Korea, Malaysia, Myanmar, Papua New Guinea, Philippines and Singapore). More recently, Bunescu (2014) for Romania and Palić *et al.* (2018) for Croatia found that the depreciation of the domestic currencies leads to an increase in external indebtedness. An alternative link between currency risk premium, external debt in \$ and depreciation is provided by Wiriadinata (2018). According to her, when the \$ strengthens, the real value of dollar debt increases and consequently weakening the currencies of countries with large amounts of dollar debt.

Sweden's debt ratio is among the lowest in the EU. Last figures for 2018 show a debt ratio of about 26% compared to about 74% from its top in 1995, i.e. a steady decline of at least 4% per year. Sweden has also experienced a budget surplus over the recent years. In 2018, the surplus was (preliminary) around 90 billion SEK, (about 1.5% of its GDP). The large deficit (131 billion SEK) observed in 2013 was motivated by the fact that the Swedish National Debt Office borrowed around 100 billion SEK to strengthen the international reserves of Riksbank that had weakened after the Lehman crash.

In Table 4 we present some regression estimates, between debt-ratio (D) and exchange rates (E), both in levels ( $E_t = \beta_1 + \beta_2(D) + u_t$ ) and changes ( $\text{Log}[E_{t+1}] - \text{Log}[E_t] = \beta_1 + \beta_2 \text{Log}[D] + u_t$ ), annually, (t-values in parentheses). It is expected that  $\beta_2 > 0$ , i.e. if the debt-ratio increases, the exchange rate will increase (i.e. the SEK is going to depreciate).

The estimates are very poor, because the debt-ratio does not seem to explain the SEK. Notice though that for the SEK/€ level,  $\beta_2 < 0$  (significant at 0.01). This means that the actual debt ratio of 26% reduces the value of € by almost 0.5 SEK and the theoretically correct value of Euro should be  $10.04 - 0.5 = 9.55\text{SEK}/\text{€}$ , i.e. again about

1 SEK cheaper than the existing one (May 2019). Alternatively, other things being equal, and the debt ratio remained at 41% (as it was in 2006), the € would cost around 9.15 SEK.

Table 4. Regression estimates between debt ratio and exchange rates

	$E_t$	$\beta_1$	$\beta_2$	$R^2$	n
Level	SEK/\$	7.65** (12.2)	0.003 (0.2)	0.002	26
Change	SEK/\$	-0.0009 (0.04)	-0.1377 (0.5)	0.01	25
Level	SEK/€	10.04** (34.6)	-0.0189* (3.03)	0.29	24
Change	SEK/€	0.008 (0.63)	0.067 (0.4)	0.008	23

Note: t-stat in parenthesis; (\*\*, \*) denote 0.01, respectively 0.05 significance level

Source: own calculations

## 6. Forecasting of exchange rates

The falsification of PPP and UIP to explain and predict the exchange rates, led me to model it as simple random-walk processes, without other macroeconomic and financial fundamentals forecasts.

According to Rossi (2013), when other macroeconomic and financial factors are included in random walks, the predictions improve marginally. Cheung *et al.* (2005) showed that the mean-squared errors from PPP models are lower than those of a random walk for longer horizons, while UIP models do not significantly improve on the random walk at any horizon. Carriero *et al.* (2009) and Dal Bianco *et al.* (2012) have improved on the point forecasts of a random walk by relying respectively on a Bayesian VAR with a large set of exchange rates, and on a mixed frequency dynamic factor model with 4-weekly exchange rates and lower frequency macroeconomic fundamentals. According to Engel and West (2005), the exchange rate unpredictability is due to the typical structural models used. They suggest that all exchange rate determination models should be re-formulated as present discounted values of current and future fundamentals, as well as unobservable shocks. Such a modelling will have a very weak correlation between the exchange rates and the current fundamentals when fundamentals are persistent and agents are patient. On the other hand, future fundamentals will matter more than current fundamentals. Rossi (2006) on the other hand argues that the instability of the relationship between exchange rates and their fundamentals is due to various trading strategies that often put different weights to fundamentals. Bacchetta and Wincoop (2009) support that and show that structural parameters are unknown to economic agents.

Yongmiao *et al.* (2007) and Balke *et al.* (2013) focused on density forecasts and showed that the density forecasts of a random walk can be improved either with non-linear models, or with univariate Taylor rule models with semiparametric confidence intervals. Della Corte *et al.* (2009), found that the time varying volatility is important for the 1-month-ahead predictive ability of macroeconomic fundamentals. Mumtaz and Sunder-Plassmann (2013) showed that a structural time varying stochastic volatility VAR, is superior compared to the constant volatility. Finally, Molodtsova and Papell (2009) and Inoue and Rossi (2012), support the Taylor rules<sup>11</sup>, while Rogoff and Stavrageva (2008) question its validity.

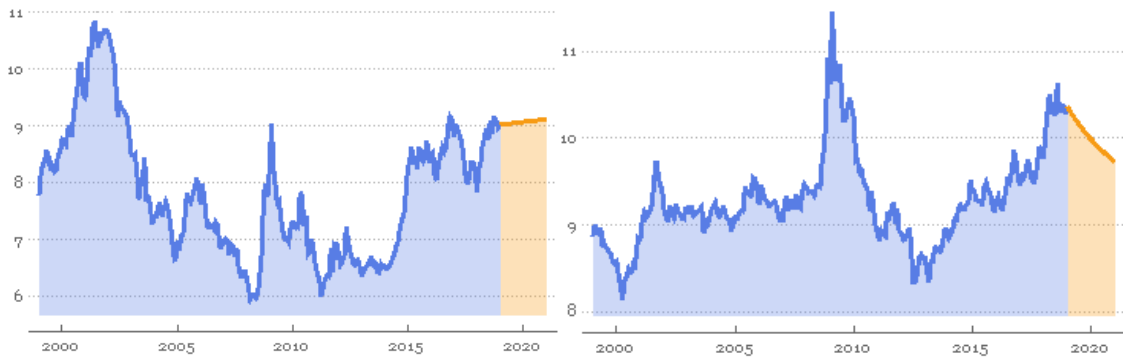
In this section, I will forecast both exchange rates, as levels and as changes, over the next two years, based only on time series modelling, *i.e.* excluding the macroeconomic and financial factors. Although the pure time series modelling is agnostic and neglects the requirements for richer explanatory variables, this simplicity and dependence only on its past values makes it flexible, powerful and dynamic in nature and adapts well to the exchange rate process.

### ▪ Exchange rates levels

The best fit for monthly SEK/\$ (Feb 1993- Jan 2019) is an *ARIMA* (0, 1, 0) process. However, that process is not stationary and its value increases by 0.004 per month. Figure 8 (left) shows that, by the end of 2020, SEK is going to depreciate slightly against \$ (to about 9.12 SEK compared to 9.02 SEK in Feb. 2019).

<sup>11</sup> The Taylor rule is not valid for Sweden because the key interest rate is set solely as a function of inflation fluctuations.

Figure 8. Historical and predicted SEK/\$ & SEK/€: 2 years outlook



Source: own calculations

Similarly, the best fit for SEK/€ is an  $ARMA(1,1)$  process, which is weakly stationary. Contrary to the SEK/\$, the SEK/€ shows that SEK is going to appreciate against € (Figure 8, right). By the end of 2019 the € is expected to cost around 10 SEK and by the end of 2020 is going to cost around 9.73 SEK, compared to 10.37 in Feb. 2019.

- Exchange rates changes

If we turn to exchange rates changes, (differences in logarithms, month-to-month over subsequent years), both series are stationary. The best fit for SEK/\$ is an  $ARMA(1,1)$  process, while the best fit for SEK/€ is an  $AR(1)$  process. Below I forecast the upper and lower bounds (Figure 9), by computing the standard errors and reviewing the entire model with the error bands (see Appendix G for the Mathematica code).

We can see where the predicted exchange rate value can go during the next two years. The SEK/\$ bounds are larger than the respective SEK/€ bounds. Again, some appreciation of the SEK is expected against both currencies. For instance, the upper bounds at the end of the forecasting period are almost equal to the latest exchange rates (Feb 2019), while the lower bounds indicate clear appreciations against both currencies. By the end of 2020, the SEK will be slightly depreciated against the \$ (by almost 2%, compared to 14% in Feb 2019). Similarly, the SEK will be slightly depreciated against the € (by almost 1%, compared to 6% in Feb 2019).

Figure 9. Historical and predicted SEK/\$ & SEK/€ changes: 2 years outlook

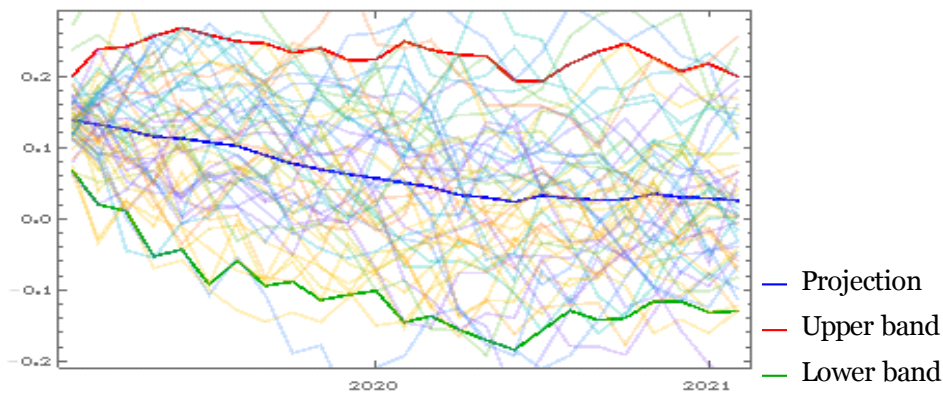


Source: own calculations

Finally, we can examine the stochastic nature of the model. I have simulated 50 future exchange rate paths over the next 24 months, determined two distributional quantiles (5% & 95%) and visualized them on the following graphs, (Figure 10 and 11). As this is often true in all future predictions, we can detect where seasonality effect can influence exchange rate forecast. This can be seen as additional 'risk factor' in the outcome prediction. From the above analysis, we can easily locate the quantile values as 'extreme outcomes' within some prediction tolerance (see Appendix G for the Mathematica code).

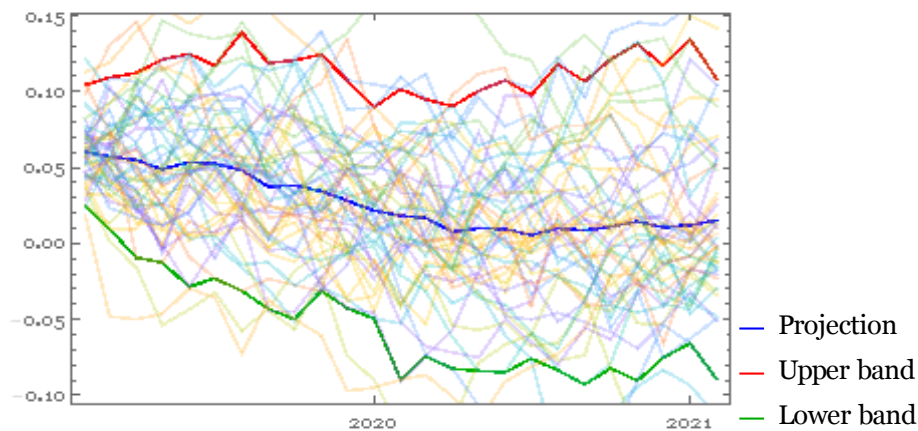
The projected exchange rates (middle, blue line) shows a strengthening of the SEK against both \$ and €. Moreover, given the fact that during the first four months in 2019 the SEK was depreciated against both \$ and € by about 4-5% (*i.e.* seems to lie above the blue line), the SEK might not appreciate as gradual and smooth as the projected blue line shows. Perhaps its appreciation is going to follow some rather sharp and volatile paths.

Figure 10. Projected paths of SEK/\$ changes



Source: own calculations

Figure 11. Projected paths of SEK/€ changes



Source: own calculations

## Conclusion

None of the four fundamental theories tested (PPP, UIP, trade balance ratio and debt ratio) explain the “weak” SEK. The lower inflation rate in Sweden over the recent years was not sufficient to strengthen the currency. Similarly, the theoretically stronger SEK implied by the lower interest rates in Sweden as the UIP predicts, has not emerged yet. Its weakness only against the \$ supports, very weak though, the carry trade hypothesis. Finally, neither the persistent trade balance surpluses, nor the declining and very low debt ratio has had any positive effects on the currency. Perhaps, two other factors, GDP or GDP/capita differentials, can explain the weakening of the SEK.

If most of the economic fundamentals are in favor and the currency is not “appreciated” by the market, it seems that the traders and investors speculate against the SEK and keep it undervalued. Moreover, a number of simulated paths, predicted from various ARIMA-processes, based on the historic exchange rates, show that the worse exchange rates have already gone and by the end of 2020 the \$ and the € will cost around 8 and 9.8 SEK respectively.

## Acknowledgement

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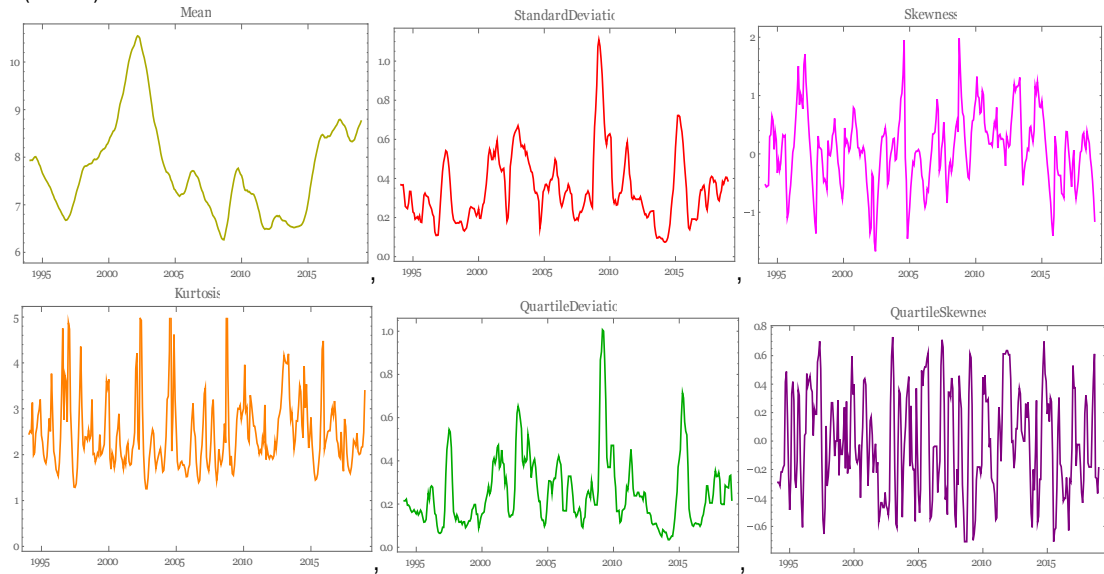
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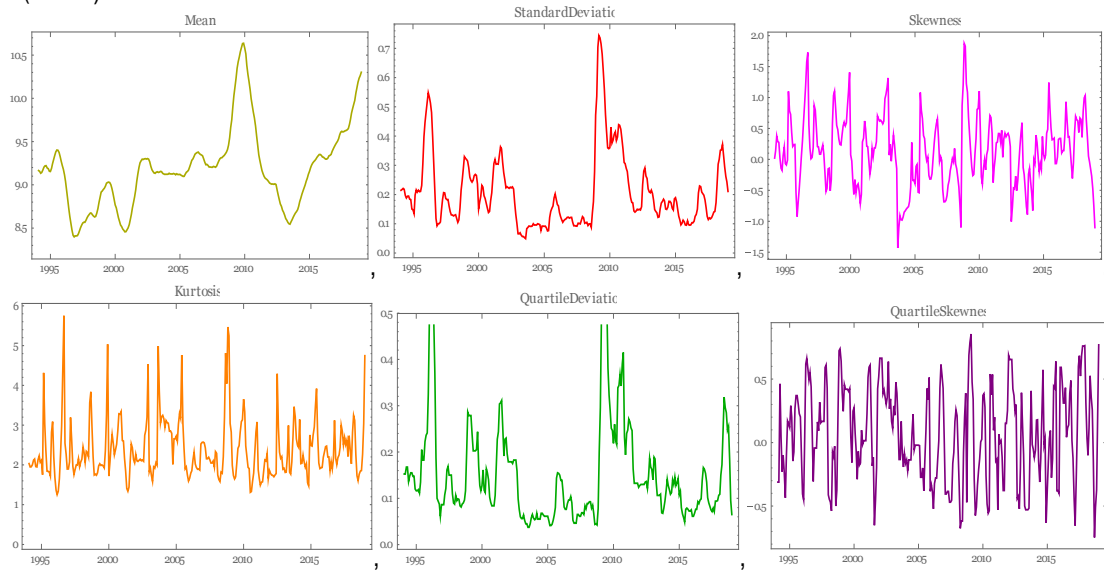
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## Appendix A

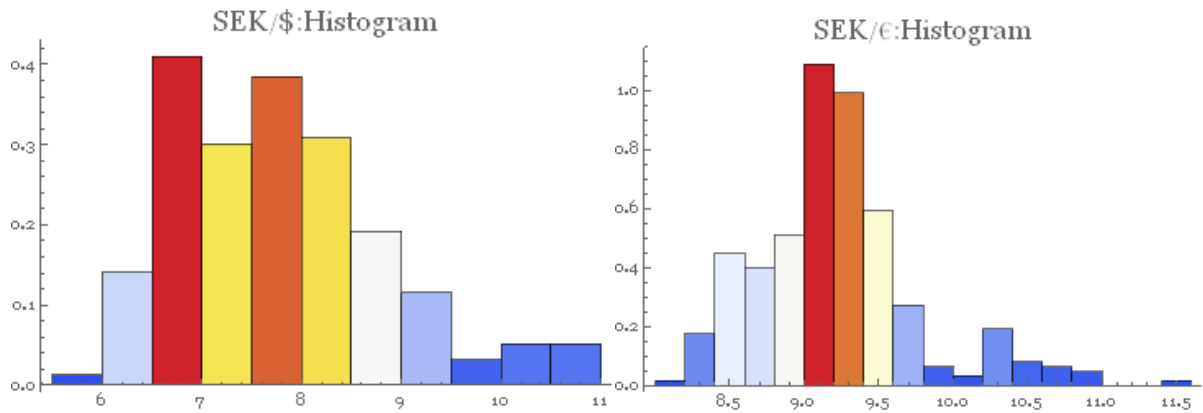
### SEK/\$ (Levels)



### SEK/€ (Levels)



### Histograms (Levels)

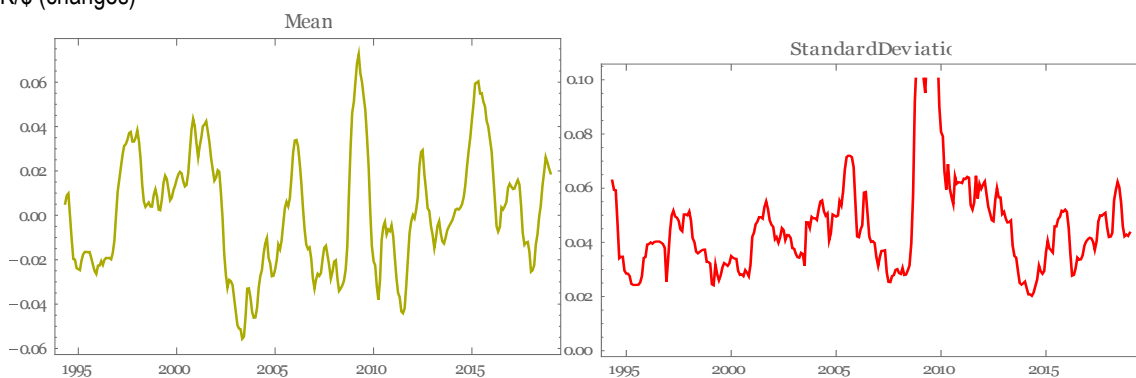


Best Kernel Distributions (Levels)

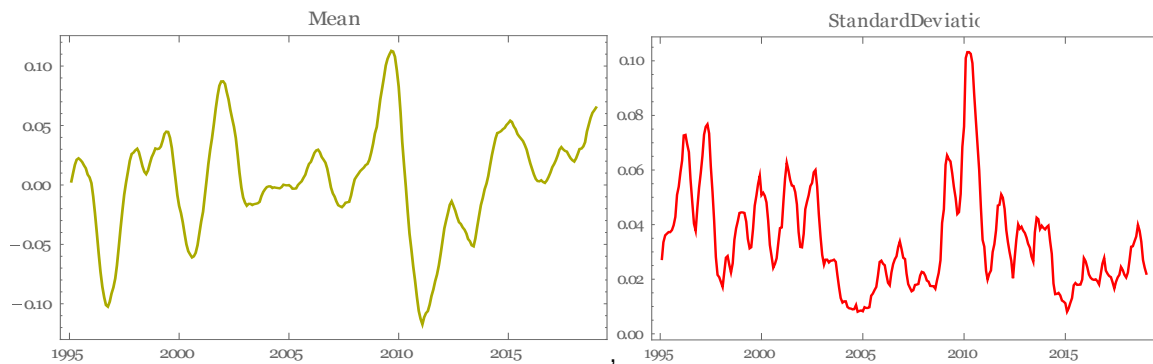
Three Best Distributions		SEK/€	
Mixture {0.91029, 0.08971}	Normal [9.093, 0.39014]	Normal [10.489, 0.41107]	
Extreme Value	{8.96299, 0.46271}		
Mixture {0.71641, 0.28359}	Normal [8.98939, 0.348979]	Log-Normal [2.2804, 0.0573663]	
SEK/\$			
Mixture {0.121621, 0.82547, 0.052908}	Normal [6.56485, 0.108846]	Normal [7.78085, 0.835565]	Normal [10.5398, 0.245357]
Mixture {0.361208, 0.451173, 0.187619}	Normal [6.8098, 0.38691]	Normal [8.10056, 0.477758]	Uniform [5.93588, 10.9395]
Extreme Value	{7.27895, 0.868243}		

Appendix B

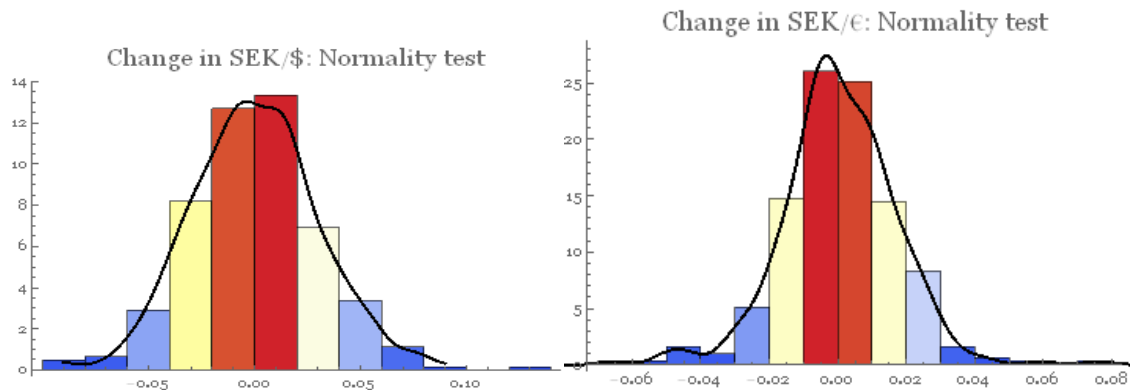
SEK/\$ (changes)



SEK/€ (changes)

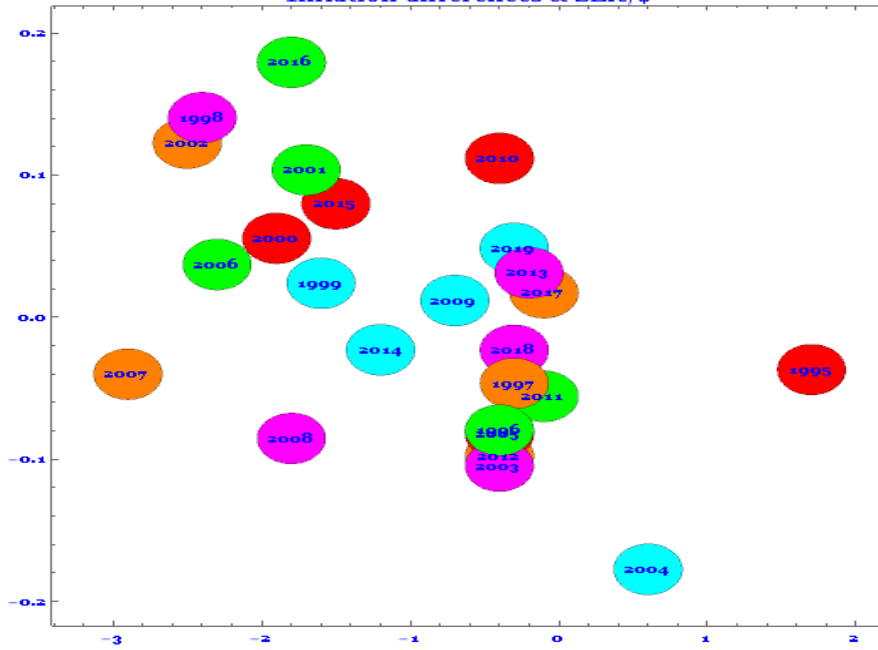


Histograms (Changes)

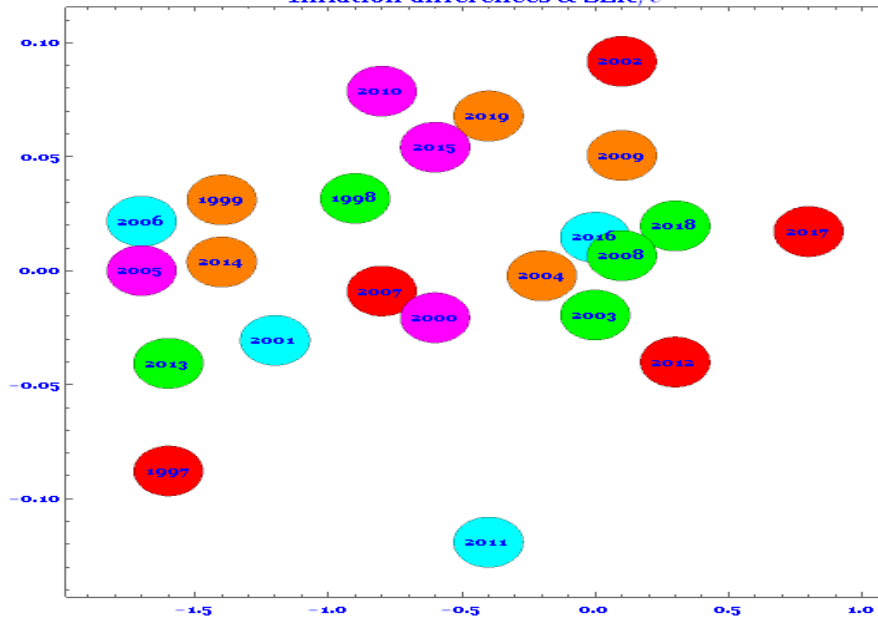


## Appendix C

Inflation differences & SEK/\$

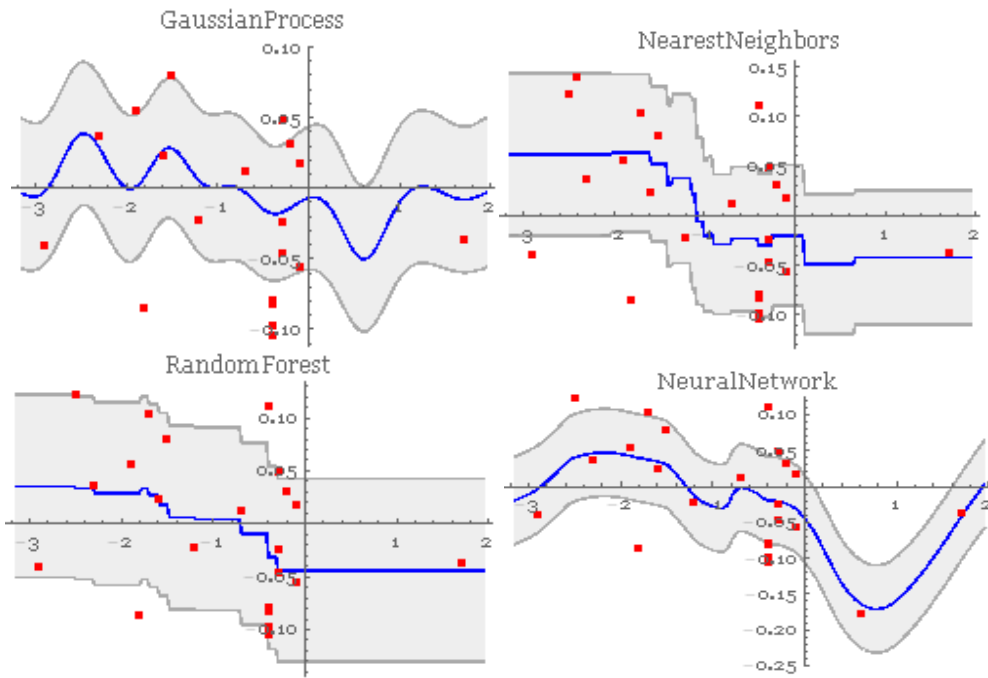


Inflation differences & SEK/€

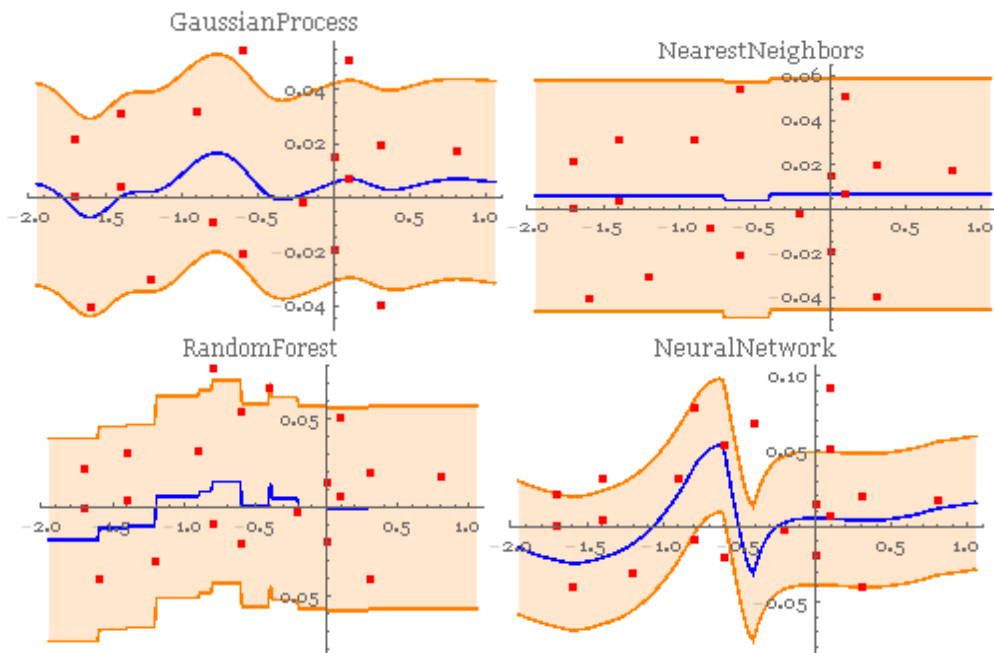


## Appendix D

SEK/\$ and Relative PPP (Additional methods)



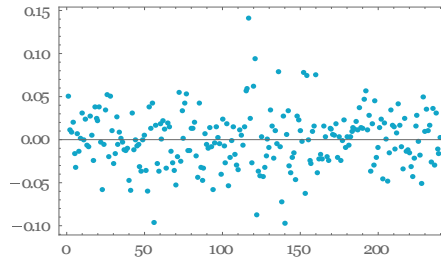
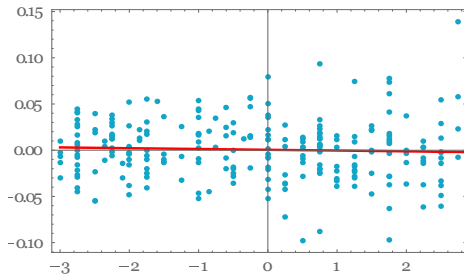
SEK/€ and Relative PPP (Additional methods)



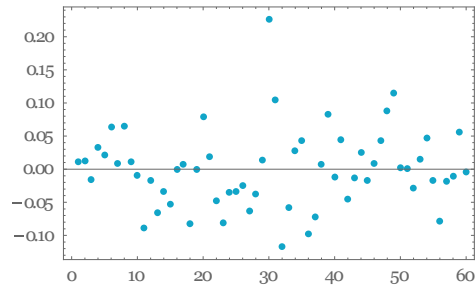
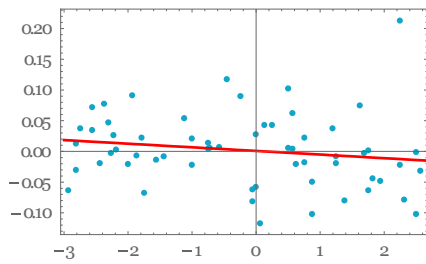
## Appendix E

SEK/\$ and IRP estimates with monthly and quarterly data

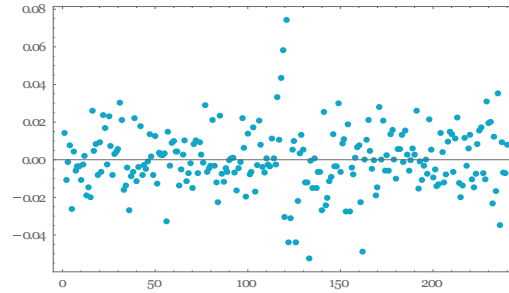
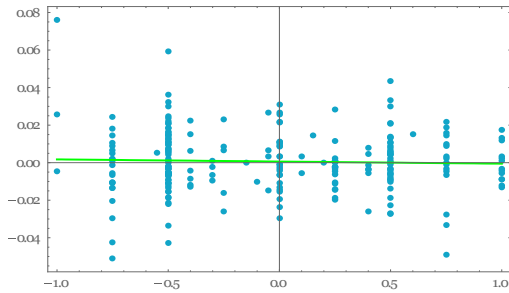
Interest rates diff. & SEK/\$



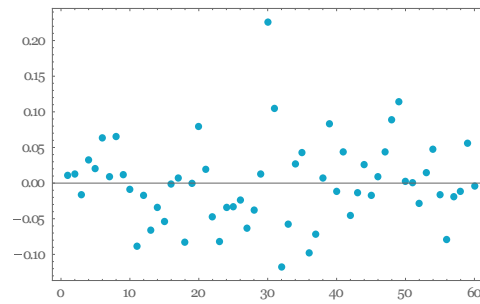
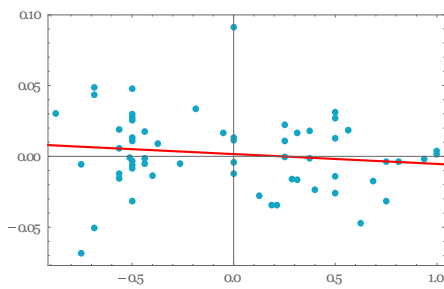
Interest rates diff. & SEK/\$



SEK/€ and IRP estimates with monthly and quarterly data

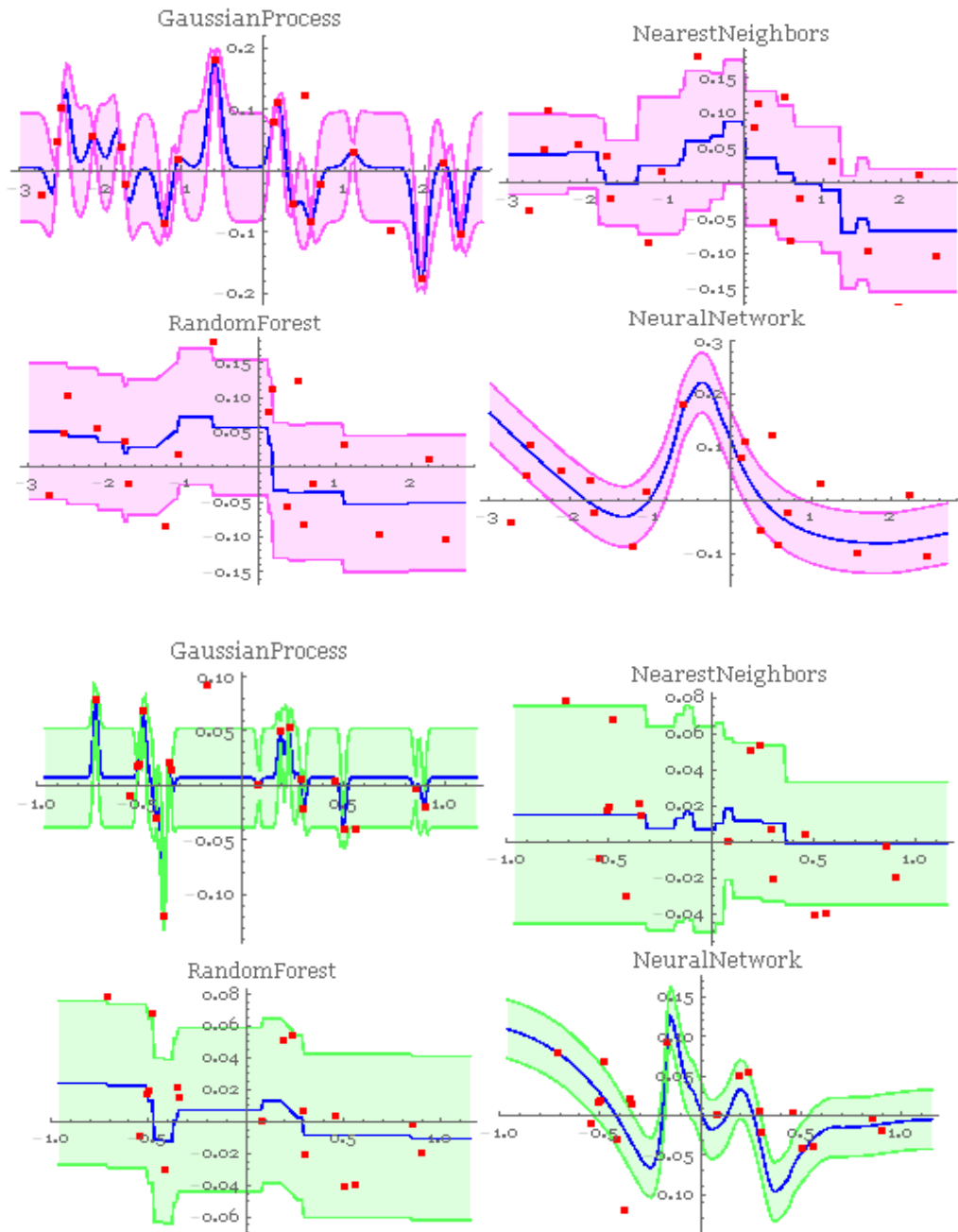


Interest rates diff. & SEK/€



## Appendix F

SEK/\$ and IRP (Additional methods)



## Appendix G

### Mathematica code for forecasting SEK/\$ changes over 24 months

```
tsdata$=TimeSeries[SEK/$]; (*Make a Time Series of the monthly SEK/$ exchange rates; 312 obs.*)
dlogSEK$=Log[tsdata$]; (*Take their logarithms*)
dlogdata$=Differences[dlogSEK$,1,12]; (*Take their month to month differences in subsequent years; 300 obs.*)

tmf$ = TimeSeriesModelFit[dlogdata$]; (*Fit a Time Series Model; it is an ARMA (1, 1) process;
ARMAProcess[0.000378, {0.913206}, {0.107103}, 0.001956]*)

forecast =TimeSeriesForecast[tmf$["Process"], dlogdata$, {0,2*12}]; (*Using the ARMA (1,1) process, make 24
temporal data with mean zero*)

TimeSeriesModelFit[forecast]; (*Fit a Time Series Model; it is an ARIMA (0, 2, 0) process;
ARIMAProcess[0.000165, {},2, {},0.000001]*)

moderr=√ forecast [ "MeanSquaredErrors" ] ;
uperr=TimeSeriesThread[{1,1}.#&,{forecast, moderr}];
dnerr=TimeSeriesThread[{1,-1}.#&,{forecast, moderr}]; (*Model the forecasting errors, as well as the upper and
down errors*)

DateListPlot[{TimeSeriesWindow[dlogdata$,{{2009,1,1}, {2019,1,1}}], forecast, uperr, dnerr}, Joined->True,
PlotTheme->"Business", Filling->{3->{4}}, PlotLegends->{"past SEK/$", "forecast", "upp err band", "low err band"},
PlotLabel->Style["% SEK/$ forecst with prediction errors",15]] (*Use a Times Series Window and Plot that,
together with the forecasted SEK/$ changes and their upper and lower errors*)
```

### Mathematica code for simulating 50 SEK/\$ changes, over 24 months

```
sim=RandomFunction[tmf$, {0, 24}, 50];
stmean=TimeSeriesThread[Mean, sim];
stup=TimeSeriesThread[Quantile[#,0.95]&, sim];
stdown=TimeSeriesThread[Quantile[#,0.05]&, sim];
sim2=DateListPlot[sim, PlotStyle->Directive[Opacity[.30]], Joined->True,
PlotRange->All];

Show[DateListPlot[{stmean, stup, stdown}, PlotStyle->{Blue,Red, Darker[Green]}, PlotLabel->Style["Projected
SEK/$ with confidence bands",15],
PlotLegends->{"Projection", "Upper band", "Lower band"}], sim2]
```



## Effects of Health Capital on Productivity and Export: In the Wake of International Economic Integration

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### Abstract:

Employing Arellano-Bond Dynamic Panel GMM estimators of 106 countries, this paper investigates the importance of health capital (life expectancy at birth) on benefits from international economic integration. It finds a significant positive impact of health capital on economic performance through the improvement in labor productivity for countries with greater trade openness. Although health capital significantly accelerates the impact of trade openness on labor productivity in low-income economies, the opposite is the case for upper mid- and high-income economies. Further, health capital decelerates the impact of financial openness in low-income economies on productivity, whereas accelerates the influence of financial openness on productivity in high-income economies. However, no significant relationship is found between health capital and the rate of export performance. It also does not influence openness variables on the rate of export performance. Interestingly, improvement of life expectancy at birth strengthens the rate of export performance until income growth slows.

**Keywords:** health capital; labor productivity; export and openness.

**JEL Classification:** C33; I10; F15.

### Introduction

Healthier labour significantly contributes to economic development through higher productivity and longer working hours, which is especially true for countries at an earlier stage of development. Investment in healthcare systems is important for expanding life expectancy at birth that leads to higher productivity and economic growth. For instance, investment in better physiological fitness enhances output per unit of time, translating into higher levels of income per working hour, and workers might work longer hours per day (Arora 2001), thus health capital is considered as a vital factor for economic growth (Boachie 2015 and Cole 2019). However, most of the empirical studies refer only to human capital and ignore the importance of health investment in building the human capital. Furthermore, in the limited number of economics studies on the health capital, most of them are about the relationship between health capital and economic growth or development. The main objective of this paper is to investigate the extent to which improving health capital helps countries benefit from globally economic integration.

Economic integration of emerging markets into the global market is a relatively recent phenomenon. In principle, integration of finance and trade improves economic performance by promoting investment and transferring technology. All countries that benefit from opening their markets to trade and investment should have sustainable growth and prosperity. However, in practice, the linkage between trade openness, financial openness and economic development is controversial and inconclusive (Aizenman *et al.* 2013, Dowrick and Golley 2004). Our study reveals a complex but clear picture that illustrates the role of health capital in reaping benefits from

economic integration by accelerating the impacts of trade integration and financial integration on labor productivity growth rate and export growth rate.

## 1. Literature review

The contribution of health as a proxy for human capital to economic growth through enhancing workers' productivity and mental capacities was investigated by Robert Fogel (1993 Economics Nobel Laureate). Fogel (1994) argues that improvements in nutrition and health contributed a third of British economic growth between 1790 and 1980. Healthier workers have more physical and mental abilities to do jobs, and they are more energetic and robust. They are also more productive and earn higher wages than their less-healthy counterparts, as they are less prone to illness and less likely to be absent in the labor market. Illness and disability are the main causes of reducing working hours that significantly decrease hourly wages. Compared with industrial countries, this is more important in developing countries where manual labor accounts for a significant proportion of the total labor force (Bloom *et al.* 2001). They also find a significant and positive relationship between health and economic growth, with a one-year increase in life expectancy leading to a rise in total output of 4 per cent. Well (2007) find health as a measure of the adult survival rate is an important factor in explaining income variation and that income inequality among countries could be reduced by the elimination of health gaps.

Various micro-studies report benefits of health to economic productivity. Barro (1996) argues that increasing life expectancy reduces the depreciation rate of human capital, which in turn attracts more investment in improving health capital. Mayer (2001a and 2001b) find that in Brazil, a higher annual income is associated with improved health. Healthier workers also have a higher marginal product of labor; thus better health could result in improved wages (Bloom *et al.* 2005). They also provide empirical evidence to illustrate that health capital positively and significantly relate to workers' productivity. Using various experiments, Maccini and Yang (2005) and Alderman *et al.* (2001) investigate the effects of long-term childhood nutrition as a proxy for health inputs on wages and schooling, and show that improvements in school completion, intelligence quotient (IQ) and wages are strongly influenced by better nutrition. It is noted that despite the significant contribution of both measures of human capital to economic performance, health capital contributes to economic growth, which is relatively higher than that of education (Ogundari and Awokuse 2018).

In the context of free trade and globalization, economic integration plays an important role in a country's economic growth to ensure its ability to adjust to global shocks (Van Rompuy *et al.* 2012). Therefore, the factors affecting economic growth are expected to have impacts on the economic integration and its benefits. Recent macroeconomic research on the importance of health to economic performance suggests that the healthier the population, the more rapid the economic development. According to Mayer (2001b) and Bhargava *et al.* (2001), improvements in health result in a sustainable increase in income, which is necessary for economic growth. The relationship between improvements in life expectancy as a proxy for health capital on economic growth is investigated by Bloom *et al.* (2004). They find that health capital has significantly positive associations with not only economic growth but also labor productivity and capital accumulation. Health capital is known to have multiple effects on economic growth. As a result, the slope of the economic growth path can increase by 30-40% as a result of improvements in health (Arora 2001). However, Narayan *et al.* (2010) argue that although health, research and development, and investment have positively impacted on economic growth, health has smaller contribution. Mayer *et al.* (2001), on the other hand, find that health capital contributes more to economic growth than education capital.

The impacts of health on the level of output can occur from two channels (Weil 2014). First is the direct effects of health - healthier workers can work harder, be more productive, work longer, be more innovative and can directly influence a country's output. Second is the various indirect effects of health. Given the same schooling, healthier students can achieve higher academic results due to higher cognitive functioning; therefore, improved health provides greater incentives to obtain schooling. This suggests that investment in health during the schooling can result in better education, and longer contracts and higher wages after graduation. Additionally, better health can help people save more for retirement, especially in the context of decreasing mortality; thus, people are encouraged to raise the levels of investment in health. Ogundari and Abdulai (2014) also show healthier workforce are relatively associated with creation and adaptation of new advanced technologies. Additionally, Acemoglu *et al.* (2001) argue that Europeans adopted different colonization policies in different colonies, with different institutions because the poor health environment in countries closer to the equator requires colonizers to put in place more institutions to control health problems; however, these institutions in turn result in decreasing levels of output. The authors use life expectancy at birth as a proxy for health capital to identify determinants of a country's productivity growth and export from indigenous industries.

Though there are a huge number of empirical studies on the effects of health capital on economic development, the literature on the association between health and economic integration is rare (Zerihun 2014). For example, the series works by Barro (1996), Bloom *et al.* (2001, 2004 and 2005), Bhargava *et al.* (2001) and Arora (2001) consider health, in the form of life expectancy, as a factor in promoting economic growth in many countries. They bring valuable insights that health thus measured has a significant and positive impact on economic performance. However, in 32 OECD members, López-Casasnovas and Soley-Bori (2014) pointed out that there was a negative relationship between economic growth and health. Furthermore, the question is whether health, in the form of life expectancy, could influence trade openness and financial openness to promote productivity growth and export growth. Our research seeks to answer this question by examining the direct impact of health on the direct benefits of economic integration (*i.e.*, the growth of productivity and export) and the indirect benefits via trade integration and financial integration.

Of empirical studies that research the relationship between health capital and economic performance in different countries, they use different proxies for health capital, study different time-periods and use different econometric techniques. Therefore, the econometric analysis of the relationship between health capital and economic performance remains inconclusive. Some studies report strong and positive associations, while others show small and positive associations, or even no significant linkage between health capital and economic performance (Bloom *et al.* 2004). One reason for this is the endogeneity in the econometric models, which leads to biased estimations. Furthermore, some papers use the Cobb-Douglas production function to estimate the effects of health capital, leading to both biased and inconsistent estimates. The reason is the measures of labor quantity tend to underestimate its effect on economic performance while the measures of human and physical capitals overestimate their effects (Benhabib and Spiegel 1994). Even though they apply diversified techniques with different data set, time frames, or economic models, most of the studies find that life expectancy has a positive and significant association with economic growth (Bloom *et al.* 2005). Contrary results above are mainly due to both endogeneity and autocorrelation issues. Arora (2001) makes the point that health is multifaceted and argues that it is essential to account for endogeneity problems.

There is therefore a strong motivation for us to apply Arellano-Bond Dynamic Panel System GMM Estimators to investigate the relationship between health capital and the benefits reaped from economic integration. This approach ensures that autocorrelation and endogeneity issues are eliminated (Roodman 2009). These advantages of the method make it the most appropriate approach for small-T large-N panels. We also divide a global panel into four sub-panels based on World Bank (2018) to make a comparison among them. Thus, our study could shed light on whether countries ought to seek economic integration based on their existing levels of health capital and income.

To sum up, literature on the relationship between health capital and benefits reaped from economic integration are still limited. Although there have been some previous studies on the relationship between labor productivity and health capital, this relationship in the context of international economic integration is missing. In addition, the current study does not cover the association between health capital and export growth in the era of global economic integration. Moreover, no study has looked at this relationship classified by income levels across countries and across the world for analysis. The objective of the paper is to contribute to addressing these gaps of previous research.

## 2. Methodology

### 2.1. Empirical strategy for selected variables

The effects of economic integration through capital flow and foreign trade on economic performance are discussed in Kutan and Yigit (2007 and 2009). The study focuses on two main benefits that countries can gain from economic integration including labor productivity per person employed, and growth of exporting goods and services. Although the total factor productivity (TFP) has been a commonly used measurement of productivity, due to the lack of data for constructing the TFP for a small sample. Canzoneri *et al.* (1999) claim that it is less likely to be tainted by poor estimates of the capital stock as it is rare to obtain accurate data on the capital stock, another advantage of using labor productivity rather than TFP. This helps to ensure that there is no erroneously overestimated or underestimated contribution from a single determinant made by mistakenly attributing it to other omitted components (Bloom *et al.* 2004). Therefore, our study uses labor working hour to measure labor productivity to capture the actual productivity. The other benefit found in economic integration is higher export growth rate due to lower barriers when an economy is highly integrated into the global economy. The benefits from economic integration are calculated as followed:

$$BE_{it} = \frac{G_t - G_{t-1}}{G_{t-1}} * 100\% \quad (1)$$

where: G represents either the exports of goods and services or the labor productivity per person employed.

To account for the proxy of health capital, life expectancy at birth is the number of years that a newborn baby would be expected to live, which is consistent in both principle and practice with many different formulas (Weil 2014). Arora (2001) indicates that life expectancy strongly influences health capital, thus it could be considered to be the appropriate proxy for health capital. For simplicity, it is assumed that the relationship between health capital and the benefits from international economic integration depends only on the average levels, not on its distribution.

Additionally, in our study, two measures of trade openness are used. Following Alcalá and Ciccone (2004), the ratio of trade that is the imports plus exports share in GDP is the most common measurement of the level of economic integration of an economy. This study also employs the ratio of foreign direct investment including both outflows and inflows stock) to GDP to measure the capital openness of a country. According to Fischer (2000), "integration into the world economy is the best way for countries to grow". Our study investigates whether labor quality can enhance the effects of trade openness and capital openness by using the interaction terms of labor quality and openness. That is calculated by multiplying the levels of life expectancy, with the levels of openness. Theoretical and empirical studies show that whether country does benefit from international economic integration depended on how much a country integrates and on its existing levels of human capital (Kosack and Tobin 2015) (Alcalá and Ciccone 2004) and (Miller and Upadhyay 2000 and 2002).

Our study employs several control variables, relying on the relatively limited number of studies on factors affecting labor productivity and export growth. Urbanization and the population growth rates control for economic size. According to Doyle and Martinez-Zarzoso (2011), the size and scale of a country have both internal and external impacts on economic development, thus a larger country would be expected to offer higher levels of openness and generate greater benefits from economic integration. In addition, the inflation rate controls for the economic stability of a country and accessing to water (% of population with access) controls for infrastructure were employed in our study.

## 2.2. Model and estimation strategy

To assess the effects of health capital on the benefits of economic integration, the estimation takes the following form for country  $i$  at time  $t$ .

$$BE_{it} = \beta_0 + \beta_1 BE_{i,t-1} + \beta_2 H_{it} + \beta_3 TR_{it} + \beta_4 FN_{it} \quad (2)$$

$$+ \beta_5 [H * TR]_{it} + \beta_6 [H * FN]_{it} + \beta_7 X_{it} + State_i + year_i + u_{it}$$

where: BE is the rate of benefits accruing from economic integration measured by the growth rate of labor productivity or the export growth rate in country  $i$  in period  $t$ . This depends on  $BE_{i,t-1}$  which is its lagged value. H is the life expectancy at birth. TR is trade openness and is calculated by the most popular indicator of trade intensity, that is (export + import)/GDP. FN denotes financial openness as measured by (FDI inflows + FDI outflows stocks)/GDP. The interaction terms are (H\*TR) and (H\*FN) to explore whether health capital accelerates or decelerates openness variables on benefits reaped from economic integration. X is a matrix of the following control variables: inflation (to account for economic stability), urban population and population growth (as a measure of country size). Finally, beside an error term (u), we add country-level fixed effects (state) and fixed period effects (year) to deal with the possible problems of using panel data in analysis.

There are several concerns of potential bias in the equation (2) such as autocorrelation, endogeneity, heteroskedasticity, a short time dimension and a large country dimension. Endogeneity problems are common in almost all econometric models. In our model, the causality may run from trade openness, health capital and financial openness to the benefits of economic integration, and vice-versa. Furthermore, time-invariant country characteristics (fixed effects) such as geography might correlate with the other independent variables. Therefore, we employ the Arellano Bond difference GMM estimator proposed by Arellano and Bover (1995), Arellano and Bond (1991) and Hotz-Eakin *et al.* (1988) to deal with these problems.

Instead of using exogenous instruments, the study adopts the ideas of Ranis *et al.* (2000) to mitigate the simultaneity bias by using lags of the original variables as instruments. Although applying instrumental variable techniques can address the endogeneity problem in principle, there are no ideal instrument variables available for

our study. The ideal instrument variable is with the error terms but highly correlated with the relevant independent variables (Bende-Nabende *et al.* 2001 and Roodman 2009). Therefore, we use the lagged values of the endogenous regressors H, TR, FN and the interaction terms as instruments. By doing this, the endogenous variables are predetermined and may not correlate with the error term. Our study also uses a Hansen-J test of over-identifying restrictions to test the validity of our instruments.

Additionally, to deal with 'fixed effects' and autocorrelation due to the presence of the lagged dependent variable, the first-differences of all variables are used. The Arellano-Bond test for autocorrelation in first-differenced errors is also used; the null hypothesis is no autocorrelation exists. If the test for AR (1) process is rejected for the first differences, we expect deeper lags of our variables should be used as instruments for endogenous variables. To account for heteroskedasticity, we use robust standard error to obtain more efficient estimates (Hill *et al.* 2014). Thus, we use the Arellano-Bond Dynamic Panel GMM Estimators designed for small-T and large-N (Roodman 2009 and Mileva 2007) with the first differences of the variables to transform equation (2) into:

$$\Delta BE_{it} = \beta_1 \Delta BE_{i,t-1} + \beta_2 \Delta H_{it} + \beta_3 \Delta TR_{it} + \beta_4 \Delta FN_{it} + \beta_5 \Delta [H * TR]_{it} + \beta_6 \Delta [H * FN]_{it} + \beta_7 \Delta X_{it} + \Delta u_{it} \quad (3)$$

We apply the Arellano-Bond Dynamic Panel GMM Estimators for all countries, and re-estimate the main model with alternative variables for specific levels of economic development, using the income classification of World Bank (2018). Accordingly, low-income economies are those having a GNI per capita of \$995 or less in 2017. Lower-middle-income economies are those having a GNI per capital between \$996 and \$3895. Upper-middle-income economies are those having a GNI per capita from \$3,896 to \$12,055, and high-income economies are those having a GNI per capita of \$12,056 or more.

### 2.3. Data and summary statistics

Due to data unavailability, we use two separate datasets. The first dataset, which consists of labor productivity and population growth, are obtained from a renowned source namely the Conference Board Total Economy Dataset. The second dataset is the unbalanced panel of 106 countries from 1990 to 2015 collected from the World Bank's World Development Indicators (World Bank 2019): Albania, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Bolivia, Brazil, Bulgaria, Burkina Faso, Cameroon, Canada, Chile, China (Official), Colombia, Costa Rica, Japan, Jamaica, Italy, Israel, Ireland, Iran, Indonesia, India, Iceland, Hungary, Hong Kong, Greece, Ghana, Germany, Georgia, France, Finland, Ecuador, DR Congo, Denmark, Croatia, Côte d'Ivoire, Jordan, Norway, Switzerland, Kazakhstan, Oman, Tajikistan, Kenya, Pakistan, Tanzania, Kuwait, Peru, Thailand, Kyrgyz Republic, Philippines, Trinidad & Tobago, Latvia, Poland, Tunisia, Lithuania, Portugal, Turkey, Macedonia, Qatar, Uganda, Madagascar, Romania, Ukraine, Malawi, Russian Federation, United Arab Emirates, Malaysia, Saudi Arabia, United Kingdom, Mali, Senegal, United States, Malta, Singapore, Uruguay, Mexico, Slovak Republic, Venezuela, Moldova, Slovenia, Vietnam, Morocco, South Africa, Yemen, Mozambique, Myanmar, South Korea, Zambia, Spain, Zimbabwe, Netherlands, Sri Lanka, New Zealand, St. Lucia, Niger, Sudan, Nigeria, Sweden. The summary of descriptive statistics related to the variables used in the research is shown in Table 1.

Table 1. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Labor productivity growth rate (%)	2756	1.56590	5.50640	-39.8866	91.3642
Trade openness (%)	2692	80.78930	53.63930	0.1674	442.62
Financial openness (%)	2682	56.53060	154.65820	2.71e-07	2,610.65
Export growth rate (%)	2586	13.51040	225.23310	-78.0552	11,412.76
Health capital (Life expectancy at birth (years))	2756	69.71620	9.75070	40.6792	84.2781
Population growth (%)	2756	1.37490	1.69050	-6.1592	19.2734
Inflation (%)	2697	57.31480	661.22170	-27.6327	26,762.02
Urbanization (%)	2755	58.15227	24.18606	0	100
Infrastructure (%)	2702	86.84460	16.80300	27.1	100

Source: Authors' calculation

### 3. Empirical results and discussion

Our results on the relationship between health capital and the benefits of economic integration are divided into two sections. The first section presents the association between health and labor productivity growth rate, using

pooled data and data of different levels of economic development. The second shows the association between health and the growth of export industries, using pooled data and data of different levels of economic development. This section answers whether life expectancy as a proxy for health capital does enhance the impacts of openness on benefits from economic integration, and which countries are better off from pursuing global economic integration.

### 3.1 The relationship between health and labor productivity

Our results are reported in Table 2, which presents the relationship between health and labor productivity growth through international economic integration. We used several alternative statistical techniques to estimate equation (2) namely generalized least squares (GLS), ordinary least squares (OLS) with fixed effect and random effect, and instrument variables (IV) with the two stage least square (2SLS) method. In all alternative specifications, there are differences in coefficient magnitudes and coefficient signs relative to our selected techniques to estimate equation 2. That is because they ignore one of three mentioned issues with regression of this data. As can be seen from Table 2, the optimal lags as instrument variables of endogenous variables are selected which rely on Hansen test as well as the Arellano-Boud test. The results from these tests imply that there is no correlation between the error terms and instrument variables (P\_value of Hansen >0.1) at 10% levels of significances. Furthermore, there is no autocorrelation at the lagged second (The Arellano-Bond test >0.1). Overall, health capital by itself has positive associations with productivity growth rate, but significantly depresses labor productivity when it interacts with trade and financial openness. The impacts of financial openness of both measurements are relatively similar.

Table 2. Econometric analysis of the effects of health capital on productivity through international economic integration, using the pooled data

Dependent variable: Rate of change in labor productivity	Arellano-Bond dynamic panel GMM estimators	GLS	OLS: FE	OLS: RE	2SLS: IV
Labor productivity growth rate (lagged-BE)	0.4187 (0.0615)***	0.3882 (0.0615)***	0.3164 (0.0458)***	0.3882 (0.0382)***	0.3391 (0.0207)***
Health capital (H)	0.1705 (0.0730)**	0.0340 (0.0244)	0.1311 (0.0785)*	0.0339 (0.0344)	0.0591 (0.0314)*
Trade openness (TR)	0.0672 (0.0267)**	0.0032 (0.0207)	0.0711 (0.0368)*	0.0032 (0.0223)	0.0057 (0.0305)
Trade * health capital (H*TR)	-0.0007 (0.0003)**	-0.00002 (0.0003)	-0.0010 (0.0005)**	-0.00002 (0.0003)	-0.00004 (0.0004)
Financial openness (FDI/GDP)	-0.0395 (0.0282)	0.0284 (0.0162)*	0.0263 (0.0218)	0.0284 (0.0175)	0.0519 (0.0260)**
FN * health capital (H*FN)	0.0005 (0.0003)	-0.0004 (0.0002)*	-0.0003 (0.0003)	-0.0004 (0.0002)*	-0.0007 (0.0003)**
Inflation rate	-0.00023 (0.0001)*	-0.0004 (0.0001)***	-0.0005 (0.0003)*	-0.00004 (0.0002)**	-0.0008 (0.0002)***
Urbanization	-0.0094 (0.0074)	-0.0139 (0.0050)***	-0.0461 (0.0354)	-0.0139 (0.0072)*	-0.0237 (0.0060)***
Population growth	-0.5113 (0.1421)***	-0.3237 (0.0551)***	-0.1988 (0.1320)	-0.3237 (0.0728)***	-0.2427 (0.0668)***
Infrastructure	-0.01219 (0.0545)**	-0.0111 (0.0104)	0.0051 (0.0326)	-0.0111 (0.0161)	0.0027 (0.0126)
Constant	-	0.7562 (1.4251)	-5.2455 (4.1633)	0.7562 (2.0033)	-1.8359 (1.9064)
Arellano Bond Test (p_value)	0.105	-	-	-	-
Hansen J (p_value)	0.988	-	-	-	-
Prob > F	0.000	-	-	-	-
Sample size	2519	2591	2591	2591	2402
Wald Chi-squared	-	782.02	-	265.95	442.89

Note: Values in parentheses are robust standard errors, and the results use only the second lag of the endogenous variables as instruments in GMM and 2SLS, \* p < 0.1 \*\* p < 0.05 and \*\*\* p < 0.01.

As can be seen in columns 1 and 2, our results support the hypothesis that higher health capital is significantly associated with higher growth rate of labor productivity at 5% levels of significance. The reason for this is that healthier labor strongly associates with lower illness, higher productivity, longer working hours and

fewer working absences, which are the main drivers to improve both the quantity and quality of production (Arora 2001). Our results also suggest that longer working hours are essential to foster economic development, especially for countries in the earlier stages of development. The effect of health on productivity discovered in our study is consistent with theoretical arguments at the microeconomic level. This supports Bloom *et al.* (2004), who find that health has a positive and statistically significant impact on economic performance through the improvement of labor productivity.

While trade openness has a significant and positive association with labor productivity, financial openness does not. This might imply that countries with economic integration gain more benefits. Importantly, the relationship between health capital and labor productivity depends on the existing level of trade openness. The marginal impact shows that health capital depresses the improvements of labor productivity in the countries, which already have higher levels of trade openness (*i.e.*, the proportion of export and import share GDP), but might accelerate it in economies with lower trade openness. In addition, though we find a negative association between financial openness and the improvement of labor productivity, the coefficient is still insignificant. Surprisingly, when we control the influence of financial openness, the impact of health capital is positive, though relatively small, and it is associated with the improvement of labor productivity. This could imply that health capital accelerates the effect of financial openness on the improvement of labor productivity, but statistically insignificant. According to Lee *et al.* (2000) lifecycle health capital might also have impacts on lifecycle savings and capital accumulation and the return of investment in education (Bils and Klenow 2000). Therefore, improvements in health might increase economic performance through the accumulation of capital.

With respect to control variables, the result shows that inflation, urbanization, population growth, and infrastructure have negative, though relatively small, associations with the growth rate of labor productivity. That could imply that lower urbanization, and lower population growth rates tend to foster rates of labor productivity. Unsurprisingly, the inflation rate is negatively associated with the labor productivity growth rate. However, the sign of the coefficient representing infrastructure variable is significantly negative, which is not expected.

### 3.2. Differences due to levels of countries' income

Table 3 reports the regression results of the association between health capital and the rate of labor productivity from international economic integration using subsamples of different levels of income to compare the role of human capital in these groups. Additionally, the optimal lags as instrument variables of endogenous variables are selected which rely on Hansen test as well as the Arellano-Bond test. The results from these tests imply that there is no correlation between the error terms and instrument variables ( $P\_value$  of Hansen  $>0.1$ ) at 10% levels of significances among sub-panel groups. Furthermore, there is no autocorrelation at the lagged second (The Arellano-Bond test  $>0.1$ ). It is interesting to note that the impact of the determinants of the rate of labor productivity depends highly on the level of economic development: higher levels of income are associated with greater coefficients of those determinants. Notice that most of the coefficients are qualitatively different from those in the whole sample. Specifically, while health capital has a significantly positive association with the rate of labor productivity in low mid-income and upper mid-income economies, it significantly and negatively relates to the rate of labor productivity in high-income countries. Surprisingly, it is found to be significantly negative in high-income countries. This might imply the effect of health capital on the rate of labor productivity is significantly positive until levels of income become sufficiently high.

Moreover, countries are better off with trade by improving the rate of labor productivity once they become wealthier because there is a significantly negative impact of trade openness on the rate of labor productivity in low-income economies, which becomes significantly positive in upper mid- and high-income countries at 10% and 5% levels of significance respectively. On the other hand, financial openness is found positive and significant only in low-income countries. It has a negative and significant association with the rate of labor productivity in high-income economies, but insignificant in low-mid and upper mid-income economies.

Could health capital accelerate the benefits of economic integration on measurements of trade openness and financial openness despite the existing levels of economic development? To investigate this, we look into the interaction terms. We find that health capital only significantly accelerates the impact of trade openness on the rate of labor productivity in low-income economies. It significantly depresses the effects of trade openness in upper-mid and high-income economies. On the other hand, health capital significantly relates to the effect of financial openness once the levels of income become high. In particular, health capital significantly depresses the impact of financial openness in low-income economies, but strongly fosters it in high-income economies. This is consistent with the fact that, while economic growth in low-income economies heavily depend on capital inflows, that in high-income economics are come from both capital inflows and outflows.

In economic theory, an unstable economy associates with lower economic performance, which is true in low-income economies where we find that inflation has a significantly negative association with the growth rate of labor productivity. But it is found to be insignificant in the other income categories. Additionally, urbanization is associated with a lower growth rate of labor productivity in low-income economies, but they have a positive and significant relationship in high-income economies. We find that in low-mid and upper mid- income economies, there is an insignificant relationship between urbanization and labor productivity. Increasing population growth rate reduces the rate of labor productivity in all economies excepting low-income countries where population growth rate has an insignificant relation with the growth rate of productivity. Surprisingly, access to water as a proxy for infrastructure is significantly negatively associated with the growth rate of labor productivity in upper mid-income economies, but it has an insignificant relation in other income categories.

Table 3. Effects of health capital on productivity through international economic integration depending on levels of economic development

Dependent variable: Rate of change in labor productivity	Low income country	Low mid-income country	Upper mid-income country	High income country
	(1)	(2)	(3)	(4)
Rate of change in labour productivity (lagged)	0.2253 (0.0879)**	0.4809 (0.0568)***	0.4165 (0.1039)***	0.3041 (0.0651)***
Health capital (H)	0.0565 (0.0657)	0.1667 (0.0708)**	0.2872 (0.1013)***	-0.2491 (0.1469)*
Trade openness (TR)	-0.2160 (0.1065)*	0.0920 (0.0551)	0.2112 (0.1096)*	0.1181 (0.0573)**
Financial openness (FN)	0.6001 (0.2385)**	-0.0330 (0.0669)	0.1067 (0.1616)	-0.0904 (0.0317)***
Trade * health capital (H*TR)	0.0040 (0.0019)*	-0.0016 (0.0010)	-0.0029 (0.0015)*	-0.0014 (0.0007)**
FN * health capital (H*FN)	-0.0103 (0.0042)**	0.0008 (0.0012)	-0.0015 (0.0023)	0.0011 (0.0004)***
Inflation rate	-0.0002 (0.0001)**	0.0001 (0.0004)	-0.0009 (0.0019)	0.0121 (0.0140)
Urbanisation	-0.1017 (0.0316)***	-0.0204 (0.0244)	-0.0142 (0.0209)	0.0239 (0.0068)***
Population growth	0.4016 (0.4643)	-0.9757 (0.3631)**	-0.9531 (0.3404)**	-0.04526 (0.1044)***
Infrastructure	-0.0239 (0.0381)	-0.0809 (0.0525)	-0.1926 (0.0866)**	0.1870 (0.1134)
Pro>F	0.000	0.000	0.000	0.000
Arellano Bond (p_value)	0.496	0.255	0.672	0.996
Hansen J (p_value)	1.000	1.000	1.000	1.000
Sample size	273	644	597	1005

Note: Values in parentheses are robust standard errors, the results in column 1 use only the third lag of the endogenous variables as instruments, the results in column 2, 3 and 4 use only the second lag of the endogenous variables as instruments, \* p < 0.1 \*\* p < 0.05 and \*\*\* p < 0.01

### 3.3. The relationship between health and export growth rate

Table 4 reports our regression results for the export equations. Although health capital has a positive association with the rate of exporting goods and services, it is statistically insignificant. This suggests that higher growth rate of exports does not depend on the improvement in life expectancy. We also find that health capital also does not significantly accelerate the impact of trade openness and financial openness, even at the 10% level of significance. We find that export performance is determined by the expansion of trade openness, which has a significantly positive association with the rate of export performance. Other determinants, namely financial openness, inflation rate, urbanization, population growth, and infrastructure are insignificantly associated with the improvement of export performance. We also find that the other proxy for financial openness as measured by the ration of FDI inflow stock to GDP has similar effects as its alternative.



Table 4. Interrelationship between health capital and the rate of export growth rate

Dependent variable: Rate of change in export performance	Arellano-Bond dynamic panel GMM estimators	GLS	OLS: FE	OLS: RE	2SLS: IV
Rate change in export (lagged-BE)	0.0048 (0.0012)***	0.0042 (0.0203)	-0.0744 (0.0029)***	0.0042 (0.0020)**	0.0036 (0.0209)
Health capital (H)	2.2209 (2.0414)	-0.7271 (1.3945)	0.0698 (0.8433)	-0.7272 (1.0934)	-0.7057 (1.5723)
Trade openness (TR)	0.9289 (0.5570)*	-1.3338 (1.2062)	3.3104 (2.3929)	-1.3338 (1.6939)	-1.7767 (1.5740)
Trade * health capital (H*TR)	-0.0123 (0.0079)	0.0164 (0.0160)	-0.0389 (0.0293)	0.0164 (0.0209)	0.0219 (0.0206)
Financial openness (FDI /GDP)	-0.1571 (0.2428)	0.6139 (0.9239)	-1.5507 (1.4981)	0.6139 (0.6799)	1.0619 (1.3019)
FN * health capital (H*FN)	0.0019 (0.0030)	-0.0076 (0.0115)	0.0192 (0.0186)	-0.0076 (0.0084)	-0.0131 (0.0162)
Inflation rate	-0.0001 (0.0005)	-0.0003 (0.0072)	-0.0014 (0.0013)	-0.0003 (0.0004)	-0.0016 (0.0085)
Urbanisation	-0.4304 (0.4161)	-0.3459 (0.2818)	-0.4237 (0.4226)	-0.3459 (0.3092)	-0.3955 (0.2968)
Population growth	0.9068 (0.5601)	0.2161 (0.0810)	1.7131 (0.7729)**	0.2161 (0.9753)	0.1059 (3.2311)
Infrastructure	-0.4946 (0.5439)	0.1495 (0.5896)	1.9019 (0.670)	0.1495 (0.2513)	0.1261 (0.6237)
Constant	-77.5206 (68.4917)	82.1353 (82.7179)	-169.8414 (173.2134)	82.1353 (92.6832)	89.0735 (96.9042)
Arellano Bond Test (p_value)	0.344	-	-	-	-
Hansen J (p_value)	1.000	-	-	-	-
Prob > F	0.000	-	-	-	-
Sample size	2421	2421	2421	2421	2310
Wald Chi-squared	-	3.93	-	703.25	3.85

Note: Values in parentheses are robust standard errors, and the results use only the second lag of the endogenous variables as instruments, \* p < 0.1 \*\* p < 0.05 and \*\*\* p < 0.01

### 3.4. Difference due to the level of economic development

The empirical results in Table 5 uses the subsamples of different levels of income to compare the association between health capital and export growth in different categories of countries. It indicates that health capital has a significantly positive association with the export growth rate, but the magnitude of the coefficients depends on the existing level of economic development. Other factors affecting exports also depend on the level of economic development.

While health capital significantly and positively influences export growth rate in upper-mid and high-income countries at 1% level of significance, it has the highest effect in upper mid-income economies followed by high-income economies. As expected, in high-income economies the marginal effects of inputs tend to be lower due to convergence effects. However, we find that there is no significant relationship between health capital and the rate of export performance in the other income categories. Since health capital has a negative relation with export growth rate in low-income countries, improvement in life expectancy at birth is expected to lead to the improvement of export growth rate until levels of income become high enough. One interesting finding is that financial openness is only statistically significant with respect to the growth rate of exports in upper-mid and high-income economies. In low and lower mid-income countries, it has an insignificant association with the growth rate of exports. While it is positive in high-income countries at the 1% level of significance, in low-mid income countries it is negative. This implies that greater financial inflows lead to a higher amount of exports in higher income countries, whereas it is associated with a lower quantity of exports in low mid-income countries and is insignificant in others. Surprisingly, there is an insignificant relationship between trade openness and the rate of export in all income categories. More importantly, could health capital accelerate the effect of trade openness and financial openness? We look at the interaction terms to answer this question. Health capital does not influence the effects of trade on the growth rate of exports in all four-income categories. On the other hand, while health capital significantly depresses the impact of financial openness in upper-mid and high-income economies, it does not influence financial openness in low mid-income economies.

The difference between these groups of countries is also evident regarding the effects of other determinants of the rate of export performance. Higher population rate statistically and significantly associates with the growth rate of exports in low-income countries. The reason might be labor forces are more concentrated on agricultural products in lower income countries, resulting in higher exports in indigenous industries. However, it has a significantly negative association with the growth rate of exports in upper-mid income economies and is insignificant in the other income categories. Another finding is that urbanization does not significantly relate to the growth rate of exports even at the 10% level of significance. This further confirms that inflation has a positive and significant relationship with the growth rate of exports in high-income economies, but in the other income categories, it is found insignificant. It is interesting to note that in upper-mid income economies or higher income, poorer infrastructure is statistically associated with the expansion of exports.

Table 5. Interrelationships between health capital and export industries growth rate depending on the level of economic development

Dependent variable: Rate of change in export performance	Low income country	Low mid-income country	Upper mid-income country	High income country
	(1)	(2)	(3)	(4)
Rate change in export (lagged-BE)	-0.0946 (0.1373)	-0.0055 (0.0094)	0.1309 (0.0583)**	0.0217 (0.0242)
Health capital (H)	-0.1617 (0.9465)	3.4062 (3.1036)	1.2052 (0.1836)***	0.9457 (0.4559)**
Financial openness	0.6255 (0.9784)	-5.6382 (5.1943)	1.1175 (0.6145)*	0.3328 (0.0831)***
Trade openness (TR)	-0.0731 (0.4016)	4.7956 (4.4619)	0.5238 (0.4162)	0.4126 (0.0036)
Trade * health capital (H*TR)	0.0089 (0.0061)	-0.1055 (0.0958)	-0.0057 (0.0058)	-0.0049 (0.0036)
FN * health capital (H*FN)	-0.0148 (0.0164)	0.1176 (0.1061)	-0.0160 (0.0086)*	-0.0041 (0.0010)***
Inflation rate	-0.0001 (0.0002)	0.0080 (0.0068)	-0.0039 (0.0067)	1.2972 (0.2193)***
Urbanisation	-0.1993 (0.2442)	-1.5042 (1.6066)	0.0566 (0.0672)	-0.0459 (0.0347)
Population growth	4.2589 (1.9493)*	-24.4812 (25.7006)	-2.7179 (1.0999)**	0.3578 (0.3143)
Infrastructure	-0.1008 (0.1116)	0.1591 (1.5009)	-0.9298 (0.1295)***	-0.7186 (0.3598)*
Arellano Bond (p_value)	0.232	0.306	0.665	0.394
Hansen J (p_value)	1.000	1.000	1.000	1.000
Sample size	263	618	574	966

Note: Values in parentheses are robust standard errors, the results in column 1 use only the second lag of the endogenous variables as instruments, the results in column 2 uses only the first lag of the endogenous variables as instruments, the results in column 3 and 4 use only the forth lag of the endogenous variables as instruments \*  $p < 0.1$  \*\*  $p < 0.05$  and \*\*\*  $p < 0.01$

## Conclusion

This paper investigates the association of life expectancy as a proxy for health capital with the benefits reaping from global economic integration in 106 countries over the period from 1990 to 2015, using the Arellano-Bond Dynamic Panel GMM Estimators. It focuses on the direct effect of health capital on labor productivity growth rate and export growth rate, and indirect impacts through openness variables (*i.e.*, trade openness and financial openness). The paper finds that the effects of health on productivity in this study are consistent with theoretical arguments at both macroeconomic and microeconomic levels. Health capital has a significantly positive relationship with economic performance through the improvement of labor productivity. This has supported further to the conclusion and theory arguments of Bloom *et al.* (2001 and 2004). However, differing from existing studies, we also find that health depresses improvements of labor productivity in countries with higher levels of trade openness (*i.e.*, the proportion of exports and imports to GDP). Additionally, health capital enhances the effect of financial openness on the improvement of labor productivity but insignificantly. Furthermore, relationship between

health capital and labor productivity is significantly positive at lower levels of income and then becomes negative when the economy becomes a high-income country.

Although health capital only significantly enhances the impact of trade openness on the rate of labor productivity in low-income economies, it significantly depresses the effects of trade openness in upper-mid and high-income economies. On the other hand, health capital significantly depresses the impact of financial openness in low-income economies, but strongly improves it in high-income economies. These converse effects require the policy makers to be careful in making decisions on improving health capital. This means that the policies to improve health of a country's people need to be concerned with the policies of economic integration, depending on the country's level of development. In particular, if the countries are at low levels of income, they should focus more on trade openness in parallel with people's health improvement. But if countries are at high levels of income, they should focus more on financial openness in parallel with people's health improvement.

Another important feature is that health capital has a positive but insignificant association with the rate of export performance. It also does not influence the impacts of openness variables on the rate of export performance. Interestingly, the improvement of life expectancy at birth leads to foster the rate of export performance until levels of income become sufficiently high. Our results provide a new way of examining the impacts of health on economic performance in the context of economic integration. Life expectancy as a proxy for health capital not only has direct impacts on economic performance but also has indirect effects via trade integration and financial integration. Furthermore, the impact of health capital on the benefits from global economic integration depends on levels of income.

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## The Effect of Leadership Style, Compensation and Organizational Commitment to Working Satisfaction of Aceh Social Service Employees

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### Abstract:

This study was aimed to determine the impact of leadership manner, compensation and departmental obligation to working satisfaction towards the employees of the Aceh Provincial Social Service. The population of this study was the employees of the Aceh Provincial Social Service with a total of 188 employees using the Slovin formula which amounted to 65 respondents. The method of data analysis was multiple linear devolutions. Based on the results of the study as simultaneously, the variable leadership style, compensation, and organizational commitment have a significant effect upon the employee job satisfaction, because the results of statistical tests obtained show the calculated F value of 14,379 greater than  $F_{table}$  of 2,358. Partially, the variable of leadership manner has a significant effect on employee job satisfaction because the results of statistical tests obtained that t-count of 2.506 is greater than t-table of 1.997, also the variables of organizational commitment have a significant effect partially towards job satisfaction because the results of statistical tests obtained that t-count is 4.307 greater than t-table of 1.997.

Therefore, the correlation coefficient (R) showed a value of 0.700 which indicates that the relation between the independent variable and the dependent variable were positive because it has a value of  $R > 0.5$ . The  $R^2$  value of 0.589 showed that only 58.9% of the differences of the dependent variable (employee job satisfaction) can be explained by the differences of independent variables (leadership style, compensation, and organizational commitment). While the persisting is 41.1% explained by other variables that are not admitted in the research might affect employee job satisfaction.

**Keywords:** leadership style; compensation; organizational commitment; employee job satisfaction.

**JEL Classification:** M52; D23; J54.

### Introduction

According to Flynn (2009, 2), leadership is the way in which the individuals affect colleagues to acquire current objective. It means the fellow participants and provides guidance in the courses specified for navigation is wrap

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together. As mentioned by Naidu and Van der Walt (2005, 2), the effective leadership style affected the change and created an impetus for transformation. Banerji and Krishnan (2000, 406) comprehend leadership as an attempt in which leaders could develop a shared vision and set the tone to influence the behavior of all in the organization to achieve shared values. The point is a shared vision created harmony by developing a prevalent mental model for employees to be followed. Thus, Jones and Rudd (2007, 522) defined leadership as a relation both of leaders and supporters in a social group. This requires providing vision, creating strength and using the power for individuals to extend their perceptions.

In consequence, the main thing that raises satisfaction from an employee to work diligently, where the form of compensation is one of the primary needs required by an employee as a human being to support their needs called as compensation. Moreover, the provision of compensation must be carried out fairly and evenly so that it can create a conducive and productive work environment for the organization. Thus, it will increase job satisfaction such as enthusiasm, loyalty, and good work morale if the compensation can be done completely.

In addition, other causes that impact must be considered in organizational commitment. The organizational commitment standard to employees as well as between worker towards the framework is very necessary because through these commitments will create job satisfaction for its employees. Thus, the nature of organizational commitment can change over time in its work is more varied and has freedom in doing work. Then, Robbins (2010, 156) stated that the employee commitment to the organization in which up to the level of an employee sided with a particular organization and its objectives, also proposed to nurture the membership in a particular organization. It means that a committed employee is employees who show high involvement in an organization.

Furthermost, there are several factors that can influence the emergence of commitment in the organizations. This organizational commitment is needed in organizations because a committed worker is important in the organization, especially to maintain the continuity and achievement of goals. Yet, employee commitment can be shown from the ability of employees to convey their duties, in obeying the regulations of the organization. Values that exist in an organization is an existing culture like a habit and norms within an organization. Therefore, an individual employee who adheres to existing norms showed the commitment of an employee is very high towards the organization.

Nevertheless, the scope of employees, in general, discusses matters relating to humanity, including employee job satisfaction. Hence, employee job satisfaction is a factor that considered as an important matter because it can affect the overall organization. Forward, the satisfaction felt by employees in the working is an indication that employees have a feeling of pleasure in carrying out work assignments. This job satisfaction is also a positive attitude of employees towards the diverse conditions in the workplace. For organizations, employee job satisfaction must receive attention and fulfillment of this matter is primarily the task of the leadership of the organization. For employees, job satisfaction is an individual factor and a means to achieve work productivity. Then, job satisfaction is a normal attitude of an individual with a high standard that showed an absolute attitude towards the job and an individual who not satisfied with the job showed a contrary attitude as specified by Robbins (2010, 139).

## 1. Literature review

As so Mone and London (2018) argued that the most accepted by employee appearance valuation about payment layout has been frequently used in the comity. Based on the concept of Miller, Erickson, and Yust (2001), they expressed that there are many causes of compensation research which undertake as individually form and multiple performance pay plan. Convey about the useful stage to perform a worthy pay for accomplishment is considered as different qualities, foremost of all worthy pay is a form of income and individual function of their individual's capability and platform to get bonus long incentives. (Lussier and Hendon 2017, Khairul Amri 2018).

Anagol *et al.* (2017), Kunze and Menges (2017) conveyed the amount of current survey around 80 to 90 percent of organizations used to earn pay. Then, Friebel *et al.* (2017) added that bounces pay was a financial reward given to an employee in adjunct to their fix replacement. In addition, the paid draft based on their individual enforcement for bonuses pays (Murphy 2013). Beside, Guo *et al.* (2017) also added the footage and performance of pay draft mostly denoted their long term incentive, also put out some supply problems to get shortly value because of its requirements on reward into cash of their liquidity long term incentive. Therefore, there is a reward like the long term advance as well as employee relation (Boschetto 2017), mostly form of cash in and stock as said by Rasch and lesson (1984).

Furthermore, payment can produce an important role in employee performance. As mentioned by Akerale (1991), he claimed the company standard also important for enhancing better work for the employee. Bring out the sincerity on their career also maintain them as an ordinary employee, it alike a mechanism of the organization

which could fund the rewards as well as undergoes the organization scan that attains any objective with its personnel is constituted as the big part of departmental. In addition, the importance of encouraging employees could not enough have motivated them with highly productive in organizations context, but more efficiency with providing and willing to hold taking in the organizations. Besides, it accused the productivity of the workers on several matters which provide well-off failure compensation for hard work. Yet, Mark and Ford (2001) said that the real success of an organization from employee to employee is having a desire to utilize their creativity among how the employee increases the positive employee usage and rewards habit in place. Thus, if the employee performance efficiently more than ten leaders, the rewards as an outcome of employee performance could be the best tribute in the company (Hurtreatal 1990, Entwisted 1987).

In consequence with Loscoco (1989), he stated that a duty commitment has been clarified as importance bound between work and one's self. The commitment is observed as a person's devotion to work appropriately, pledge towards a career/profession, mission involvement, and organizational commitment. It means that individuals could feel committed to an organization, go beyond management, observer, or a specific workgroup. Likewise, commitment is a complex point and a multi-faceted setup that would take diverse forms of matter. Further, the commitment has been studied with regard to "career, union and profession" (Darolia, Kumari and Darolia 2010). Moreover, some studies showing the specimen of high work engagement and also evident with highly associated with organizational performance. It is the second most commonly studied job manner in I/O psychology for this excuse according to PSUWC (2013). At the same time, this impressed all organizations at some level and sustain companies to evaluate issues like turnover throughout times of varying economic balance. Regarding all these conditions, it interacts to configure the conceptual framework of each individual's work commitment. In fact, the higher employee job satisfaction, the higher work commitment.

Afterward, there are several relation marketing literature confesses another prospect driver of customer loyalty, firstly, relation commitment (Bendapudi and Berry 1997, Morgan and Hunt 1994). Secondly, the illustration of the organizational proceeding literature (Meyer and Allen 1997). Then, trading scholars have variously assigned commitment as a willingness to hold up a bond (Moorman, Deshpandé and Zaltman 1993, Morgan and Hunt 1994). Next, a pledge of continuity between group (Dwyer, Schurr and Oh 1987), and the potential for sacrifice if the correlation was ended (Anderson and Weitz 1992). Lastly, the shortage of competitive dedication (Gundlach, Achrol and Mentzer 1995). These various resources create a "stickiness" that put away customers loyal to a brand or company even when satisfaction may be weak.

Additionally, the several clarifications proposed two major dimensions of relationship commitment: affective commitment and calculative, or continuance commitment (Fullerton 2003; Hansen, Sandvik and Selnes 2003; Johnson *et al.* 2001). For clarification, calculative commitment is reasonable, economic-based depend on product profit due to a deficiency of choice or replaces costs (Anderson and Weitz 1992; Dwyer, Schurr and Oh 1987; Heide and John 1992). Next, affective commitment is a memorable matter owned by the customer with a company that sustains through the grade of change or personal involvement where the outcome in a higher level of trust and responsibility (Garbarino and Johnson 1999; Morgan and Hunt 1994).

However, Mester *et al.* (2003, 72) remarked that job satisfaction can be extensively clarified as the extent to which the worker is amused by the job. Besides, job satisfaction has received considerable attention, resulting in the construct being extensively researched over the past years. People spread attitudes towards their jobs by considering their feelings, actions, and faith. Then, Peerbhai (2006, 13) justify that high satisfaction levels directly into absolute feelings while low satisfaction levels direct to disagreement feelings. Beyond that, a major breach into meaning job satisfaction in a way of the Hawthorne studies conducted by Elton Mayo and F.J. Roethlisberger in Wickstrom and Bendix (2000, 364). The study findings uttered that good working term increased job satisfaction level among employees and also affirmed that people work for an objective other than pay. Then, employees' moods and emotions are point structure blocks that built the effective element of job satisfaction. Job satisfied employees showed higher levels of commitment to their jobs and organizations'. This result could be increased as efficiency levels and low turnover with the whole positive effect on the success of the organization.

Alongside, Robbins, Odendaal, and Roodt (2003, 134) proposed the Herzberg's Theory that associated with two elements, such as a real absolute sources (achievement, recognition, and promotion), termed motivators, while dissatisfaction is concord with abolish extrinsic sources (pay, policies, working conditions, and supervision), termed hygiene element. Thereby, the authority trade a reasonable motivator increased basis clearly that could allow higher satisfaction levels. In recollect, Vroom's Expectancy Theory confronts that job satisfaction is evaluated by what common can presume from one's job against what the job is perceived to be a tribute (Randeree and Chaudhry 2012, 63). In this approach, one company could either increase the payment whether narrow outlook to advanced the satisfaction.



## 2. Discussion

Based on government regulation number 5 of 1958 concerning the submission of field assignments, guidance, and improvement to first-level regions that have implemented government regulations and have accepted the submission as the tasks in question, then to implement it at the end of 1958 the Aceh Special District Social Service was formed. As the assignments were handed over by the center, in 1962 a Representative Office of the Department of Social Affairs of the Special Region of Aceh was formed by the Chairman of Mr. Usman Ibrahim who did not have branches in the Regencies. In order to avoid prolonged dualism and unfavorable competition in the work of the two Level 1 Social Agencies, the Ministry of Social Affairs and the Aceh Special Region Government agreed to appoint a leader to lead the two Social Institutions into one. Part of the social tasks become the domestic affairs of the Regional Government. With the decision of the letter of the Governor to the Special Region of Aceh Number 49/III/KPTS/1969, on March 24, 1969, an organizational instructor applied the composition of the tasks of the assignment to the Social Service of the Aceh Special Region Province.

The Aceh Social Service is the regional apparatus as the implementing elements of the Aceh Government which has the task of carrying out the general tasks of the Aceh government in the field of Social Welfare. The Social Service of the Nanggroe Aceh Darussalam Province was formed based on the Aceh Qanun no. 5 of 2007 concerning the organizational structure and official work procedures, regional technical institutions and regional institutions of the Province of Nanggroe Aceh Darussalam, with the main tasks: "Carry out the general tasks of the Aceh Government in the field of welfare empowerment, social assistance and aftercare in the approval with the usable laws and regulations".

The respondents' number of this study as many as 65 people using the Slovin formula as a tool to calculate the sample area in the Office of Social Services, namely 65 respondents. Of the 65 questionnaires circulated, all were filled in as needed, so that a number of questionnaires were worth analyzing. The characteristics of the respondents referred to in this study consisted of gender, education, the age of respondents, and marital status. In finding out how the composition of the respondents' feature corresponding with the criteria above, it will be demonstrated within the form of the frequency distribution table of respondents and an explanation related to the table.

Table 1. Gender distribution of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Man	27	41.5	41.5	41.5
	Woman	38	58.5	58.5	100.0
	Total	65	100.0	100.0	

Based on the table above, it can be seen that the respondents male sex amounted to 27 people or 41.5%, while the female numbered 38 people or 58.5%. Thus in this study respondents dominated female employees.

Table 2. Distribution of respondents' education levels

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	S1	52	80.0	80.0	80.0
	S2	6	9.2	9.2	89.2
	SMA	7	10.8	10.8	100.0
	Total	65	100.0	100.0	

Based on the table above, it can be seen that the education level of the 65 respondents who were the most was S1, as many as 52 people or 80.0%, followed by the education level who had completed the high school level as many as 7 people or 10.8%, and followed by the education level of S2 only 6 people or 9.2%.

Table 3. Distribution of respondent's age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	30-35 years	26	40.0	40.0	40.0
	36-44 years	29	44.6	44.6	84.6
	45-50 years	10	15.4	15.4	100.0
	Total	65	100.0	100.0	

Based on the table above, it can be seen that for the smallest age respondents are employees aged 45-50 years as many as 10 people or 15.4%, then employees aged between 30-35 years as many as 26 people or 40.0%, and employees aged between 36-44 years as many as 29 people or 44.6%.

Table 4. Distribution of respondent's marital status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single	23	35.4	35.4	35.4
	Married	42	64.6	64.6	100.0
	Total	65	100.0	100.0	

Based on the table above, it can be seen that the marital status of unmarried respondents is 23 people or 35.4%, while those who are married are 42 people or 64.6%.

Table 5. Validity test results

No	Variable	Question Item	$r_{\text{statistic}}$	$r_{\text{table}} (N=65)$	Information
1	Leadership Style ( $X_1$ )	A 1	0,750	0,244	Valid
		A 2	0,722		
		A 3	0,646		
		A 4	0,703		
2	Compensation ( $X_2$ )	B 1	0,568	0,244	Valid
		B 2	0,561		
		B 3	0,405		
		B 4	0,474		
3	Organizational Commitment ( $X_3$ )	C 1	0,330	0,244	Valid
		C 2	0,456		
		C 3	0,450		
		C 4	0,347		
4	Employee Job Satisfaction ( $Y$ )	D 1	0,335	0,244	Valid
		D 2	0,532		
		D 3	0,274		
		D 4	0,735		

Source: primary data processed, 2018

Based on the table above shows the magnitude of the correlation coefficient between each item with a total item for instrumental leadership, compensation, organizational commitment, and employee job satisfaction. The magnitude of the coefficients of the items for the leadership style instrument is ranged from 0.646 to 0.750, the coefficient of items for compensation instruments ranged from 0.405 to 0.568, the coefficient of items for organizational engagement instruments ranged from 0.330 to 0.456, while the employee job satisfaction instrument showed numbers range from 0.274 to 0.735. Because the r-count value of these variables is greater than the r-table value of 0.244. So it can be interpreted that all questions related to these five variables (leadership style, compensation, organizational commitment, and employee job satisfaction) are declared valid.

Table 6. Testing the reliability of research variables

Variable	Cronbach Alpha Count	Cronbach Alpha Required	Information
Leadership Style ( $X_1$ )	0,773	0,50	Reliable
Compensation ( $X_2$ )	0,628	0,50	Reliable
Organizational Commitment ( $X_3$ )	0,439	0,50	Reliable
Employee Job Satisfaction ( $Y$ )	0,535	0,50	Reliable

Source: primary data processed, 2018

Based on the table above, it can be seen that the results of Alpha Cronbach calculation are the value of the leadership style instrument has a weight of 0.773, the value of the compensation instrument has a weight is 0.628, the value of the instrument of organizational commitment has a weight of 0.439, while the value of the instrument of employee job satisfaction has a weight is 0.535. Thus it can be concluded that the total value of each of the five variables is reliable.

## Conclusion

Simultaneously the variables of leadership style, compensation, and organizational commitment have a significant effect on the employee job satisfaction because the results of statistical tests obtained show  $F_{\text{count}}$  value of 14,379 greater than  $F_{\text{table}}$  of 2,358. Partially leadership style variables have a significant effect on employee job satisfaction because the results of statistical tests obtained show that t-count of 2.506 is greater than t-table of 1.997.

Partially, compensation variables have a significant effect on employee job satisfaction because the statistical tests result obtained that t-count of 3.957 is greater than t-table of 1.997. Partially, organizational commitment variables have a significant effect on job satisfaction, because the results of statistical tests obtained show that t-count is 4.307 greater than t-table of 1.997. As a result, the correlation coefficient (R) shows a value of 0.700 which indicates that the relationship between the independent variable and the dependent variable is positive because it has a value of  $R > 0.5$ .

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## Subliminal Persuasion on a Consumer's Cognitive Process: A Review

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### Abstract:

The ability of subliminal messaging for communicating with the consumers' unconscious minds is questionable, especially among the marketing scholars. This article intends on providing some insight on this perplex situation by reviewing experimentation studies in the area of cognitive and behavioral neurosciences. These basic research studies employed laboratory settings for controlling the influence of extraneous factors to provide a more conclusive causal relationship between the stimulus and the neural activity. The result from reviewing the findings from these sources suggested a strong possibility of subliminal messages reaching and influencing consumers' decision processes, but only to a certain extent. The consumers face a more complex situation in reality than in the laboratory-setting environment. This as well as other reasons limit the ability to fully transfer the knowledge from the cognitive and behavioral neurosciences to the business practices.

**Keywords:** subliminal; unconscious; neuroscience; priming; marketing; consumer behavior.

**JEL Classification:** M31; M73; D91; D87; D71; E71.

### Introduction

To enhance the effectiveness of the marketing strategy, subliminal appeals are pervasive in the business practices (Theus 1994, Broyles 2006, Elci and Sert 2017). While many practitioners believe in the effectiveness of subliminal cues, their influence on the human cognitive process has been debated upon by the scholars. On one hand, many are convinced the subliminal exposure can modify the consumer's cognitive decision process (Harris and Murawski 2010, Hartmann *et al.* 2013, Salgado-Montejo *et al.* 2015). On the other hand, many researchers (Mladenović *et al.* 2016, Košíková and Pilárik 2012, Trappey 1996, Smărăndescu and Shimp 2015) doubted the subliminal stimulus could significantly affect the consumer behavior. Yet, even those who observed insignificant influence, warned it was premature to conclude the subliminal priming could not influence the consumer choice behavior as there were several limitations inherited in several studies (Košíková and Pilárik 2012, Newell and Shanks 2014). On searching upon the academic literature on this topic, the existing reviews could not resolve this contradiction.

To evaluate the extent to which the subliminal message can induce desirable behaviors, this article reviews studies conducted in cognitive and behavioral neurosciences. It starts by presenting different neuroscience tools. The second section describes the process of conducting a literature review from the area of cognitive and behavioral neurosciences. The third section presents the findings from this review. In the last section, the applicability of these findings to the real-life context and the implications for practitioners and academic researchers are discussed.

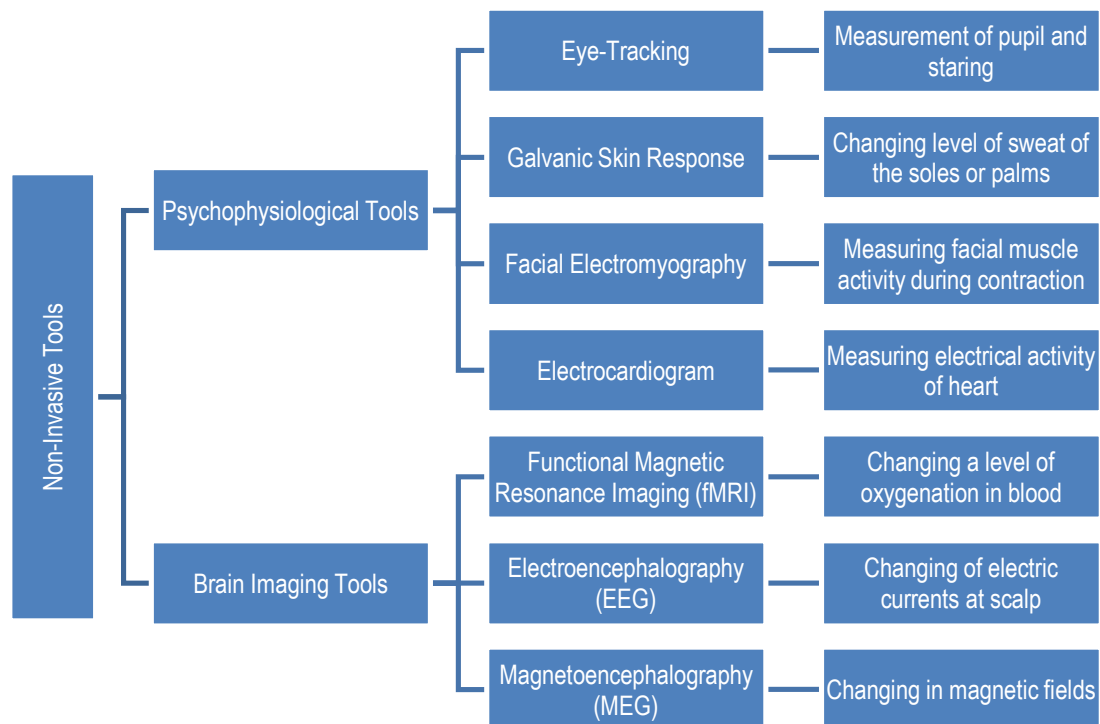
### 1. Research background

The presentation of the subliminal stimulus has to be assured to reach the unconscious brain (Košíková and Pilárik 2012, Newell and Shanks 2014). By employing a neuroscience tool when a subliminal cue is noticed by the unconscious mind, specific regions in the brain relevant to the unconscious mind will be activated (Mladenović *et al.* 2016). Recording the physiological parameters (*i.e.*, blood flow, brain waves, and magnetics) of the brain of the individual subjects provide direct measurement of the delivery of the subliminal messages as well as the changes of the brain activity caused by these subliminal cues. Compared to self-reports or observations, neuroscience methods collect the data on continuous and instantaneous measurements of a subject performing a designated task or responding to a stimulus. This allows a researcher to match the task or stimulus to the neurophysiological response. Broadly speaking, noninvasive neuroscience techniques in observing activities of the brain are classified into psychophysiological tools and brain imaging tools (Dimoka *et al.* 2012) (see Figure 1). Psychophysiological

tools include skin conductance, facial coding, and eye tracking, which tap the outside reflexes as they are expected to have their origin in the brain and act as a response to the designated stimulus. However, the result of these psychophysiological tools could be unreliable (Wang and Minor 2008, O'Connell *et al.* 2011) because other irrelevant factors to the planned stimulus could cause these external reflexes (Dimoka *et al.* 2012).

The brain imaging equipment, including electroencephalogram (EEG), functional magnetic resonance imaging (fMRI), and magnetoencephalography (MEG), is considered to be more accurate compared to a self-report technique by tapping into activities of the active brain cells (Venkatraman *et al.* 2015). These brain imaging techniques measure different physiological events, such as blood flow and chemical magnetism, while the electrical impulses move around the brain (Zurawicki 2010). The electrical impulse starts at the neurons or nerve cells, which are the main units of the nervous system. Once, the brain receives the input from the sensory system, such as taste, smell, and sight, these cells start firing electrical signals among networks of neurons and send motor commands to the muscles (What is a neuron? *n.d.*). The two cells communicate through their synapses, creating electric nerve impulses, generating a magnetic field, and releasing specific chemicals (*i.e.*, neurotransmitters), which in turn evoke electrical activity (*i.e.*, electromagnetic) in the next cell. This electrical activity among the many neurons gives rise to a thought process, such as giving meaning to an object or assessing the quality of a product, which can be measured using the neuroscience tools. Specifically, EEG records the electrical activity, fMRI measures the oxygen level from the blood flow into an active neural region, and MEG measures the magnetic activity.

Figure 1. Classification of neuroscience tools



Source: Adapted from Dimoka *et al.* 2013

## 2. Methodology

In searching for the evidence on the effect of the subliminal stimulus on the human cognitive process, this section begins with a systematic review of existing studies in the cognitive and behavioral neuroscience. Cognitive neuroscience is the study of how the brain system creates the mind in terms of patterns of thought, language, problem solving, and memory, while behavioral neuroscience emphasizes on the biology of the human behavior and typically observes the neurons, neurotransmitters, and other basic biological processes that trigger behavior (Smelser and Baltes, 2001). Subsequently, I describe the methods of experimentations under subliminal conditions as well as types of neuroimaging techniques used to gauge neuro reactions to unconscious stimulus. Finally, based on the studies included in this review, the extent to which subliminal stimulus can affect the brain's decision-making process is described.

## 2.1 Literature research

EBSCO Discovery Service search engine (EDS) was employed. The search of the term “subliminal stimulus” yielded 51,160 articles on diverse topics published in academic journals during the 2008-2019 period. To identify relevant studies, articles included in this review had to meet the following criteria:

- clearly state that their objective was to study the effect of subliminal stimulus on human’s cognitive process, which would exclude studies on the effect on automatic or non-voluntary motion;
- employ an experimental method to test the causal relationship between unconscious stimulus and the neural reaction;
- rely on a research paradigm of neuroscience in communicating this stimulus to the brain;
- use healthy adults as subjects, which would exclude studies with patients, children, infants, or animals;
- utilize one of the neuroimaging techniques described above to gauge neural responses to subliminal cues.

Therefore, string search terms such as “subliminal or unconscious or unaware or implicit,” “fMRI or EEG or MEG or neuro-imaging,” “not review or comment,” and “not patient or epileptic, schizophrenia or hemianopia or autism or Parkinson or bipolar” were employed. This search reduced the number of articles to 262.

The next step was to scan the full text of these articles to further refine the results from EDS. In addition to the above criteria, articles that solely intended to improve experimental techniques or validate the role of specific neural areas were excluded if they did not provide information relevant to the purpose of this study. Commentary or review articles were also omitted since they lacked the detail on how the experimentation was conducted. Only 31 articles met these criteria. I then classified them according to hierarchical indicators of the effectiveness of commercial message aimed at motivating consumers to patronize a product or service, and these indicators are attention, emotion, memory, preference, and action (Pradeep 2011, Pozharliev *et al.* 2017). This categorization showed that 4 articles were relevant to attention, 9 to emotion, 6 to memory, 4 to preference, and 10 to action.

Table 1 summarizes experimental methods used in the selected 31 studies that investigated the effect of subliminal stimulus on human cognitive process.

Table 1. Experimentation methods

Author (year)	Sample (age, N)	Subliminal manipulation	Awareness check	Neuroimaging
<b>a) Attention</b>				
King <i>et al.</i> 2012	18-33, 25	Change blindness	Post-hoc visibility report	fMRI
Yokoyama <i>et al.</i> 2013	20–29, 12	Dichoptic view	Post-hoc visibility report	EEG
Uono <i>et al.</i> 2018	21.8 (1.9), 20	Backward masking	Post-hoc visibility report	EEG
Giattino <i>et al.</i> , 2018	18-35, 37	Object substitution	Visibility report at each trial	EEG
<b>b) Emotion</b>				
Kiss and Eimer 2008	29.2 (n.r), 14	Backward masking	n.r.	EEG
Pegna <i>et al.</i> 2008	27.3 (3.9), 18	Backward masking	n.r.	EEG
Ibáñez <i>et al.</i> 2011	F 22.3 (2.5), 7	Reduced display	Post-hoc visibility report	EEG
	M 21.6 (2.3), 6	Time		
Balconi and Ferrari 2012	19-27, 20	Backward masking	Visibility report at each trial	EEG
Prochnow <i>et al.</i> 2013	25.1 (3.6), 44	Backward masking	Post-hoc visibility report	fMRI
Lia and Lu 2014	20-26, 17	Backward masking	Post-hoc visibility report	EEG
Wang <i>et al.</i> 2016	18-27, 26	Backward masking	n.r.	EEG
Pichon <i>et al.</i> 2016	F 26.9 (5.6), 15	Sandwich masking	Visibility report at each trial	fMRI
	M 25.8 (5.6), 15			
Jiang <i>et al.</i> 2018	18-28, 36	Dichoptic view	Visibility report at each trial	EEG
<b>c) Memory/Learning</b>				
Pessiglione 2008	F 23.8 ± 3.3, 9	Sandwich masking	Visibility report at each trial	fMRI
	M 25.8 ± 6.3, 11			
Chalfoun <i>et al.</i> 2011	27 (3.5), 43	Sandwich masking	Post-hoc visibility report	EEG
Hollenstein <i>et al.</i> 2012	25.2 (6.3), 25	Mirror-masking	Post-hoc visibility report	EEG

Author (year)	Sample (age, N)	Subliminal manipulation	Awareness check	Neuroimaging
Kongthong <i>et al.</i> 2013	22-39, 14	Sandwich masking	n.r.	EEG
Gao <i>et al.</i> 2014	22-24, 20	Sandwich masking	Post-hoc visibility report	EEG
Jiménez-Ortega 2017	18-51, 24	Backward masking	Post-hoc visibility report	EEG
d) Preference				
Gibbons 2009	20-43, 25	Sandwich masking	Post-hoc visibility report	EEG
Cacioppo <i>et al.</i> 2012	18-26, 20	Backward masking	Post-hoc visibility report	EEG
Gillath <i>et al.</i> 2012	19.65 (n.r.), 19	Sandwich masking	n.r.	EEG
Mohan <i>et al.</i> 2016	19-33, 40	Backward masking	n.r.	EEG
e) Action				
Pavone <i>et al.</i> 2009	n.r., 10	Binocular fusion	n.r.	EEG
Hashimoto <i>et al.</i> 2011	19-29, 16	Backward masking	n.r.	fMRI
Wokke <i>et al.</i> 2011	n.r., 27	Crowding paradigm	Post-hoc visibility report	EEG
Charles 2013	23.2 (n.r.), 16	Object substitution	Post-hoc visibility report	EEG
Parkinson <i>et al.</i> 2016	19.69 (1.58), 19	Sandwich masking	Visibility report at each trial	EEG
Teuchies <i>et al.</i> 2016	22.37(4.21), 30	Metacontrast masks	Visibility report at each trial	fMRI
Sidarus <i>et al.</i> 2017	24.38 (4.90),35	Metacontrast masks	Post-hoc visibility report	EEG
Dall'Acqua <i>et al.</i> 2018	23.53 (2.86), 28	Metacontrast masks	Post-hoc visibility report	fMRI
Bensmann <i>et al.</i> 2019(a)	23.7 (3.02), 40	Backward masking	n.r.	EEG
Bensmann <i>et al.</i> 2019(b)	23.86 (3.20), 243	Backward masking	Post-hoc visibility report	EEG

Note: n.r. = Not report

## 2.2 Sampling

Studies using neuro-imaging techniques tend to use smaller sample sizes and limited age groups compared to a typical survey study, *i.e.*, the samples found in the selected articles ranged from 12 to 44 participants aged 18 to 43 years old. Sample sizes are typically restricted because participants must meet specific requirements to avoid the difference in neural responses caused by other factors than the intended stimulus. For instance, the experiment of Dall'Acqua *et al.* (2018), which relied on EEG, included only right-handed subjects with normal or corrected-to-normal visual clarity without a history of neurological or psychiatric disorder. When using the fMRI, additional requirements include no pregnancy; no irremovable metals, like pacemakers or implants; and no claustrophobia. In addition, financial and technical challenges prevent the recruitment of large sample sizes. Collecting the data from each participant by using these tools is more expensive compared to the survey method (Turner *et al.* 2018) and more time consuming, as it involves setting up the experiment, training participants prior to the actual experiment process, and analyzing a large number of data on neuron activities of each subject.

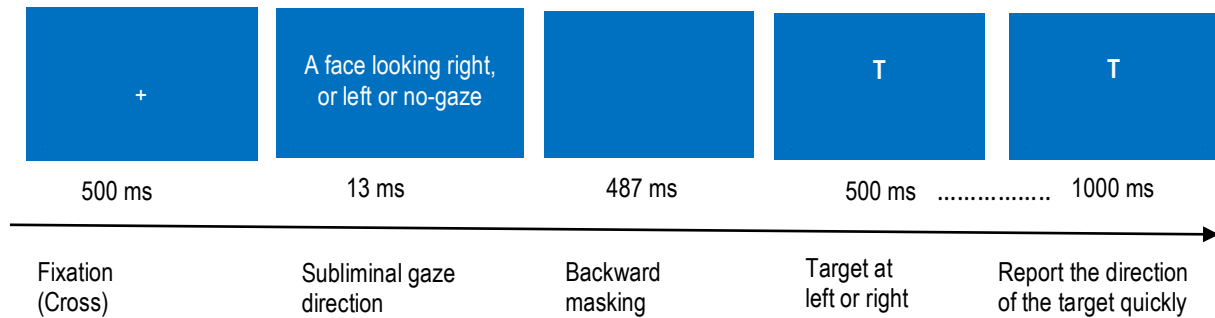
## 2.3 Stimulus presentation

To assess the influence of unconscious message on the neural process, researchers manipulate stimulus, priming, presentation duration, and masking techniques. Stimulus is typically presented during the study at some point, and measures are taken to determine the effects of the stimulus. Priming is a technique in which the introduction of one stimulus influences subjects' subsequent responses and/or behaviors. For instance, after presenting a prime word "yellow" and asking people to name a type of fruit, they are likely to answer "banana." Stimulus presentation time is shortened to the point that it can elude consciousness (Doyen *et al.* 2014). Thus, subliminal priming aims to expose a stimulus below the threshold of perception beyond the realm of consciousness to make the brain more sensitive to a subsequent stimulus (Elgendi *et al.* 2018). This brief presentation of a subliminal prime is coupled with a mask or masking technique to prevent people to see the prime. The most often used masking method in the 31 studies in this review was the backward masking paradigm. A briefly presented stimulus in tens of millisecond (ms) is followed by a mask (unseen) image. For instance, Uono *et al.* (2018) investigated different patterns of electric neural activity from subliminal eye gaze (prime), causing the brain to shift its attention to a specific location (see Figure 2). Each subject had to complete 72 trials (times) in this experiment. A trial started with white crosshairs shown in the middle of a computer screen for 500 milliseconds (ms) (see Figure 2). Next, a subliminal eye gaze cue (prime) was presented for 13 ms followed by the mask for 487 ms. The eye gazes could be left, right, or straight.



The mask was a mosaic scrambled image of a face to make it unrecognizable. The subliminal presentation time was so brief that participants were unaware of a gaze direction. Next, participants had to report quickly and correctly the location of the target (letter "T"), which could appear either on the left or right side of the screen. The influence of unconscious prime was evident when the direction of the eye gaze could guide the participant to locate the direction of the target more quickly and accurately compared to a non-cue condition. In addition, a neuro-imaging tool was used to measure a participant's neural activities initiated by the unconscious prime, compared to the condition in which the unconscious prime was missing.

Figure 2. An example of a sequence of stimulus presentation under subliminal presentation condition



Source Adapted from Uono *et al.* (2018)

In addition to the backward masking method, the 31 studies in this review used also other masking techniques, including backward and forward masking (or sandwich masking) paradigm, dichoptic presentation, object substitution masking, change blindness paradigm, and metacontrast masks. These paradigms are based on different methods that are used to hide stimulus from the conscious brain (Axelrod *et al.* 2015, Jiang *et al.* 2018, Yokoyama *et al.* 2013). For the sandwich masking technique, a mask is shown after and before a briefly presented stimulus to prevent participants from consciously seeing the stimulus. The dichoptic presentation is deployed by presenting a different stimulus to each eye, *e.g.*, a face image is shown to the non-dominant eye while Mondrian patterns are flashed to the dominant eye. Object substitution masking involves briefly showing a set of images consisting of a target object surrounded by a frame or dots and several distractors. Change blindness paradigm relies on the presentation of two sets of slightly different stimuli that cannot be easily detected and lessens time interval of stimuli presentation, which reduces the visibility. While the previously described masking techniques depend on the target and mask is presented on the same retina location, the mask in the metacontrast technique does not overlap with the target location.

Generally, to be certain that the stimulus is presented subliminally, participants in an experimental setting are asked whether they see anything before the appearance of a mask at the end of the experiment. This post-hoc visibility check was commonly used in the articles listed in Table 1. Alternatively, the visibility checks at the end of each trial also validated that participants did not consciously see the prime.

#### 2.4. Neuroimaging techniques

Twenty-six studies out of 33 employed EEG to investigate the influence of subliminal stimulus on neural process while the remaining studies used fMRI. These techniques belong to non-invasive, safe and painless neuroscience methods, making them more popular in studying the human brain compared to invasive techniques (Dimoka *et al.* 2012, Grau *et al.* 2014). The EEG and fMRI have a different temporal and spatial resolution for measuring brain activity. Spatial resolution is the ability of the equipment to precisely pinpoint active areas of the brain. High spatial resolution techniques are able to differentiate the location of the activity even though two regions of the brain are relatively close to each other. The temporal resolution provides the information at the precise moment when brain activity is occurring (Gabrieli 2011, Zani *et al.* 2012), fMRI has a better spatial resolution compared to the EEG due to its ability to capture a flow of the oxygen-rich blood movement to a specific region of the brain (Hsu 2017). However, it generates poorer temporal resolution since the changes in blood flow occur several seconds after the occurrence of the neuronal activity. Subsequently, fMRI is slower in tracking the neural activity in real time.

For EEG, an electrode cap is placed on the head to capture the electromagnetic effects of the neuronal activity traveling through the brain. Beneath each electrode, there are thousands of neurons. Each electrode records the sum of the changes in voltage in the axons of these neurons. EEG is able to capture neural processing at the moment that it happens in milliseconds, allowing it to have superior temporal resolution vis-a-vis fMRI. However, its ability to capture the electrical wave only at the skull reduces its ability to differentiate specific regions

or circuits in the brain, thus decreasing its spatial resolution. Even though EEG is inferior to fMRI in terms of spatial resolution, its machine and operating costs are much lower compared to fMRI, making EEG a more popular method among academic researchers (Farnsworth 2017).

### 3. Results: Subliminal influence

The influence of the unconscious message found in this literature review is presented in the following sections according to hierarchical levels of the decision-making process, starting from attention, emotion, memory, preference, and action.

#### 3.1 Attention

The ability of the commercial message to reach the consumers' attention is the first step towards effective communication. Four studies found on this topic (see Table 1) concurred that subliminal priming can influence both temporal and spatial attention. Temporal attention refers to the brain's allocation of its capacity to deal with a specific activity at a certain time while spatial attention refers to the brain's focus on a specific location (Babiloni *et al.* 2004). The participants who viewed a subliminal prime (cue), which suggested the location of a subsequent image before they were urged to report quickly the location of a seen image as it appeared on a computer screen, responded faster and more accurately compared to the no unconscious cue condition in the study of Giattino *et al.* (2018). This effect of an unseen cue on getting attention from the brain was also evident even when the brain was distracted by irrelevant image (King *et al.* 2012). That is, even though unrelated images were shown at the same time and the same location as the unseen cue, subjects were still able to detect a subliminal prime and use it to guide their responses.

However, the brain was able to detect certain subliminal cues better than others, as seen in the study of Yokoyama *et al.* (2013). Specifically, the researchers found that the brain could unconsciously process a direct gaze faster than left and right gazes. Even though the brain can detect both unconscious and conscious information, it relies on different neural regions to process the information. That is, the unconscious process occurred at the subcortical area, residing below the cerebral cortex, while the conscious process occurred at the cortex, the uppermost part of the brain (Uono *et al.* 2018). The findings of these studies are consistent with the conclusion of various review articles (Kouider and Dehaene 2007, Brooks *et al.* 2012, Mnegusso *et al.* 2014), which stated that subliminal cues can reach and gain the attention of the unconscious mind.

#### 3.2 Emotion

Since the brain detects subliminal information, in this section, I consider whether the brain understands a subliminal emotional message. Emotion is an outcome of the mental process in response to a person's assessment of an incoming stimulus (Scherer *et al.* 2001). It can be expressed as happiness, love, fear, anger, or hatred. For instance, when a person confronts a snake, he/she would immediately think that he/she is in danger; thus, he/she would experience the emotion of fear. Nine empirical studies identified in this review evaluated this condition. Balconi and Ferrari (2012) stated that the brain can respond to various emotional subliminal faces, including fearful, happy, surprised, and angry facial expressions. Likewise, Prochnow *et al.* (2013) concluded that the neural area relevant to empathy in social encounters is activated while processing subliminal emotional faces. In their study, only subliminal emotional facial expressions changed neural activities related to emotion while subliminal natural faces did not (Kiss and Eimer 2008).

However, some emotional primes exerted more influence compared to the other ones. In fact, the brain reacted to fearful subliminal cues faster (Pegna *et al.* 2008, Lia and Lu 2014) and more intensely (Jiang *et al.* 2018) than did other unseen emotional faces for self-preservation reasons (LeDoux 1996). Moreover, the brain processed a subliminal cue using unfamiliar faces with a fearful expression as more dangerous or threatening compared to the subject's own face (Ibáñez *et al.* 2011). In addition to the type of emotional information, an unconscious stimulus influences the mental process based on how the brain pays attention to the incoming stimulus. The brain was more receptive to emotional subliminal stimulus when presented with a specific visual task in which a subliminal message was part of this task (Pichon *et al.* 2016). However, if a subliminal message was not part of the task and had to compete to gain the brain's attention, the brain seemed to ignore this unconscious information entirely, especially when the brain was overloaded with other tasks (Wang *et al.* 2016).

#### 3.3 Memory

For subliminal persuasion to be effective in the long-term, a new piece of unconscious information must be interpreted, integrated, and stored in the network of memories to be retrieved for a subsequent decision. Three out

of six studies on this topic (Hollenstein *et al.* 2012, Ibáñez *et al.* 2011, Kongthong *et al.* 2013) assessed whether the brain can interpret the meaning of a subliminal image and lexicon. When providing an unseen cue, such as images of famous versus ordinary persons, the brain can identify the picture of famous persons faster (Kongthong *et al.* 2013). However, the degree to which the brain could understand words is still inconclusive. On the one hand, the brain may be able to process the information only at a low level, *i.e.*, being able to only distinguish letters from non-letters but unable to determine whether these letters are actual words (Hollenstein *et al.* 2012). On the other hand, Jiménez-Ortega *et al.* (2017) found that the brain can process a subliminal lexicon message at a much higher level, *i.e.*, it understood the meaning of the word.

The other three studies in this category revealed that subliminal information can become an integral part of memory in solving problems. In a study by Pessiglione *et al.* (2008), unaware cues associated with monetary rewards helped subjects make the correct decision and earn more financial rewards. When asking to be creative in reporting unusual uses of an object, subliminal cues in the study of Gao and Zhang (2014) helped subjects come up with its uncommon uses. For example, when asking subjects to list atypical use of “a roll of film” (a problem) and presenting “gauge” (an unseen cue), participants came up with different uses of a roll of film in measuring objects. Likewise, the study of Chalfoun and Frasson (2011) revealed that subliminal cues assisted subjects in finding solutions for a logic-based problem-solving task quickly. As the subliminal cue was being integrated into a memory, subjects were not aware of this process and reported that they used their own intuition to derive the solution.

Even though these studies provide evidence that the brain relies on subliminal information to solve problems, whether subliminal information could be stored in the long-term memory is still questionable, as laboratory-based studies employing brain imaging techniques have not been included in this review. The evidence from studies that have not used neuroimaging methods seems to suggest this possibility. For instance, the study of Ruch *et al.* (2016) presented evidence of the longevity and influence of subliminal messages on the subjects’ conscious judgment. In their first experimentation, subliminal presentations of the face–occupation pairs (for instance, manager and high income-occupation versus postal worker and low income-occupation) were found to be able to guide conscious decisions about the income of the same faces 15-25 minutes later. In their second experimentation, the vocabulary of foreign words presented subliminally was able to influence the subjects’ judgment of the correctness of word translations after a 20-minute delay. Additionally, in the study of Sweeny *et al.* (2009), a memory of the surprise faces lasted 24 hours after they were shown. The implicit cue may be stored longer, as seen in the study by Lowery *et al.* (2006). Subliminal prime with words associated with intelligence could be stored in long-term memory for one to four days before a midterm and help students increase their midterm scores.

### 3.4 Preference

Stimulus cues exert a higher level of influence on preference, which can appear in different forms, such as liking, fondness, trust or preference. Four studies that used neuroimaging techniques to investigate this influence concluded that subliminal primes can enhance the subject’s like or dislike of an object or living things. When viewing landscape painting, place, or portrait photographs, positive subliminal prime words increased the subject’s preference for the painting (Gibbons 2009, Mohan *et al.* 2016). Similarly, when presenting subliminally beloved names, the neural network related to pleasure and reward was activated (Cacioppo *et al.* 2012). Exposure to the subliminal sexual image was associated with higher activation in arousal-related areas as well as the behavioral control network for women compared to men, indicating that women were more sensitive to this image compared to men (Gillath and Canterberry 2012).

### 3.5 Action

The greatest influence of unconscious stimulus pertains to action. Ten studies explored this topic. Nine out of these ten studies suggested that unconscious primes could influence a person’s action. For instance, in the study of Wokke *et al.* (2011), in which researchers tested the effect of subliminal action cue on the actual action, subjects were instructed to withhold their response when viewing a “no-go” sign on a computer monitor and to press a button when seeing a “go” sign. They found that unconscious “no-go” primes presented before “go” signs would slow-down responses compared to unconscious “go” primes. Instead of using “go” and “no-go” signs, Teuchies *et al.* (2016) used directional arrows to form congruent and incongruent conditions. For the congruent condition, the direction of a subliminal arrow prime was the same as the direction of a seen arrow. For the incongruent condition, the directions of a subliminal arrow and a seen arrow were different. They reached a similar conclusion to Wokke *et al.* (2011) that in the incongruent condition, subjects made more errors and had a slower reaction. In addition to congruent and incongruent conditions, in the study of Sidarus *et al.* (2017), an arrow with a specific direction (*e.g.*, left or right or up or down) appeared first followed by a colored circle. Participants were instructed to detect

the connection between a visible colored circle and the direction of a visible arrow, e.g., an arrow pointing right may be linked to a blue circle. Without a subliminal directional arrow, participants were able to associate the direction of a visible arrow with the color. However, the dissimilarity of directions of a subliminal arrow and a visible arrow confused subjects, slowing down their action and increasing the number of errors they made, making them feel that they were unable to detect this association. Instead of using arrows, Parkinson *et al.* (2016) relied on emotional faces as primes to influence subjects' reaction to various colors (e.g., when seeing green, press "go" sign). They found that using subliminal angry faces was more effective in making people withhold their actions than using fearful or happy faces. While other studies tested the effect of one stimulus at a time, Hashimoto *et al.* (2011) investigated the condition in which subjects performed two tasks and faced different subliminal primes aimed at these tasks. Here, participants were asked to make two decisions simultaneously. The first task asked them to detect whether the currently seen word was similar to the previously seen word, and the second task asked them to determine whether the word related to food. Presenting subliminal primes facilitated subjects' performance, i.e., they responded faster and more correctly. In fact, both unconscious and conscious stimuli work together in influencing participants' behavior by increasing speed and accuracy when performing a specific task (Bensmann *et al.* 2019(a), Bensmann *et al.* 2019(b)).

While a subliminal stimulus influences the brain's response to take or withhold action, the brain is fully aware of this influence. In the study by Pavone *et al.* (2009), after errors were committed during various choice tasks, the error-related negativity (ERP) component in the EEG was observed, indicating the brain realized its mistake. The study of Charles *et al.* (2013) further suggested that although the participants' brains showed a clear pattern that they were aware of this error, the participants reported that they were uncertain that they made a mistake. That is, in the visible prime condition, participants were highly aware that they made errors but in the unconscious setting, they were only somewhat aware of their error decision.

Even though the above findings seem to suggest that subliminal priming can influence the brain to engage in or disengage from a specific action, a person still possesses an ability to abandon an action right before implementing it. This is consistent with Dall'Acqua *et al.*'s (2018) study, where instead of forcing subjects to select an action (e.g., press A or B), participants had an option to do nothing. They found that subliminal priming failed to significantly influence participants' responses, i.e., masked priming was unable to control a person's action.

#### 4. Applicability

The above review supports the influence of the subliminal stimulus in the operation of the brain concerning attention, preference, and memory, and also likely in the case of action. While the evidence from laboratory-based settings is overwhelming, the debate on the effect of the subliminal message on the consumer decision-making process and behavior is expected to continue for the reasons outlined below.

##### External validity

Like those studies employing awareness cues, the application of cognitive neuroscience knowledge gained from subliminal studies faces challenges in terms of external validity or generalizability (Smedt 2014). The laboratory-based experimental setting in which brain imaging equipment is used creates an unnatural environment limits the external validity of the findings (Dimoka *et al.* 2012). Furthermore, experimentations in most cognitive neuroscience studies deal with simple task manipulations, such as detecting circular shapes or matching words (Kasai *et al.* 2015). To obtain reliable data on brain activity while performing a specific task, a large number of trials of the same task have to be implemented. However, consumers deal with a more complex environment when making a purchase. For instance, shoppers are surrounded by various commercial appeals, such as posters, banners, package designs, and salespeople at the point of purchase, making it difficult to separate the influence of each of these stimuli. In a typical experiment, subjects make a simple decision, such as go or no go, but shoppers face more complex decisions, as they have to evaluate various brands based on different aspects, such as the quality, price, sizes, and services. Because of these differences, the applicability of the findings from neuroscience to real-life settings is questionable.

##### Samples

A typical laboratory-based study uses a small sample size. Only the study by Bensmann *et al.* (2019b) used 243 participants. The use of small samples increases the possibility of finding a causal relationship even though there is none (Button *et al.* 2013; Simmons *et al.* 2011). In addition to overestimated effect size, a replication study is likely to reach different results. Button *et al.* (2013) urged neuroscientists to collaborate among different laboratories in conducting a single study. This would alleviate the problem of small sample size due to high expenses and time

constraints. In addition, raw data should be publically available to allow other researchers to cross-check their analyses and results as well as integrate the existing datasets with new ones.

### Correction

The influence of a subliminal commercial message on consumers' selection of a specific product might be unrealistic, as the error-related negativity (ERN) process, will detect and correct the wrong decisions. The ERN is elicited by a response conflict that occurs when consumers face competing alternatives (Charles *et al.* 2013, Rodilla *et al.* 2016). Even under non-conscious conditions, the brain is still able to implicitly detect errors and attempts to correct them (Cruz *et al.* 2016, Shalgi and Deouell 2013). Thus, if the consumers were to be convinced subliminally to select a less preferred brand, their unconscious brain would still notice this mistake and make a correct decision, *i.e.*, choose their preferred brand.

### Social interaction

A social exchange between individuals is a fundamental of human society. Consumers' daily life experiences have to influence and get influenced by other human beings. However, the studies in cognitive and behavior neuroscience only observe the neural activity of each participant. Thus, the interaction among brains in cooperating, competing, or communicating is not captured (Astolfi *et al.* 2011).

The neural process, when a subject interacts with neuroscience tools, may be different from the interaction with the human beings. For instance, the study of Lau and Passingham (2007) found participants were more committing to cooperative decisions when using human eye contact than no eye contact. In fact, social cognitive neuroscience is an emerging interdisciplinary field of research concerning the study of human brain mechanisms that allows people to interact with each other to operate the social world effectively (Ochsner and Lieberman 2001, Lieberman 2007). Implementing neuroscience in the real life setting and interpersonal interaction environment would enable researchers to investigate dynamics of brain responses in more natural social situations (Kasai *et al.* 2015).

### Conclusion

For the marketing manager, the reaction of consumers in terms of brand experience, attachment, affective response, and loyalty is important to the success of products and services (*e.g.*, Ikpefan *et al.* 2018, Sidorchuk 2017, Bacik *et al.* 2015). Subliminal appeals could be an effective tool to achieve these desirable responses. The findings from cognitive and behavioral neurosciences are promising in that subliminal prime could affect the consumer's decision-making process when buying a product. Even though the impact on action or purchase is still not conclusive, subliminal messages could affect the consumers' attention and preference. In the current situation, where consumers experience massive commercial messages daily, subliminal message is an additional venue to get their attention. It might be superior to those aiming at the conscious level as the processing capacity of the unconscious mind has larger capacity than the conscious one and controls a larger part of our behavior (Morsella *et al.* 2016). The possibility of convincing the consumers to prefer our product is intriguing if an appropriate method in delivering the message coordinates with the way the brain is processing. For instance, positive words and smiling faces can arouse preference rather than negative words or sad faces. Preference can be formed and possibly lead to purchasing intentions. Moreover, subliminal cues may not have dissipated immediately but potentially stored and used in subsequently decisions. A single communication of the subliminal stimulus may not create a long-lasting impression, but the repetition of the same favorable message may establish links between neurons and be stored in a long-term memory to be retrieved for later decision (Meltzer *et al.* 2017). Despite all of these promising benefits of subliminal messages, marketers should lower their expectations of the effectiveness of subliminal messages, as applications of the findings in laboratories, compared to a real-life situation, requires validation of its applicability in complex daily life situations of consumers.

For academic researchers in marketing, these findings provide a clear evidence subliminal stimulus can be used in guiding consumer cognitive processes. However, before this method can be employed with confidence, there are several factors that are needed to be considered in studies. As previously stated, a typical study in this field relies on a small sample size and specific types of participants, leading to possible unreliable results. Findings from neuroscience have to be validated by other studies using different research methodologies (Garner *et al.* 1956). For instance, by employing multi-methodological approaches, findings from studies using neuroscience methods could be used to develop hypotheses and traditional behavioral experiments or a survey to validate the findings. Thus, marketing researchers should not expect neuroscience to replace conventional measurements of

behavior but should view it as a complement tool that enhances the current method in collecting and analyzing consumer behavior (Pozharliev *et al.* 2017).

In addition, researchers should also embrace the social cognitive neuroscience as consumers interact with other people to form opinions towards products and to reach buying decisions. This interaction is found in various contexts beyond traditional modes such as live online product reviews with net idols or other online chats. Furthermore, the research interest should be placed on other research topics in this field, such as social connection, interpersonal attraction, cognitive dissonance reduction, and social factors in economic decision making (Lieberman 2007).

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## The Analysis of the Economic and Financial Indicators through the Human Resources Management Point of View

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### Abstract:

For any organization, the human resources are a primordial resource of today and tomorrow, which ensures their survival, development and competitive success. In the context in which the modern society is presented as a network of structures that appear, evolve or are lost, the human being is an ordinary and very important resource that ensures the survival, evolution and the competitive success of these. In the absence of the people who know exactly how, when and what to do, it is impossible as an organization achieve its goals. All the resources of the organization are precious and useful, but the human resources and their management are very important and valuable in dealing with the unknown. The human resources are the only ones able to express and produce all the other resources which are the disposal of the organization. At the base of the economic and financial evolution of any economic entity there are the human resources, their degree of training and their competencies. In order to illustrate the way in which their acquired knowledge and managerial competence were used, we will present the evolution of the basic economic and financial indicators within a company which is focused on the distribution activities of the professional cleaning products.

**Keywords:** human resources management; organization; professional training; economic and financial indicators.

**JEL Classification:** M54; M53.

### Introduction

The human factor is a dynamic resource of the organization, as its efficiency, human knowledge and enthusiasm, its initiatives and evolution contribute actively to the development of the organizational efficiency and effectiveness. By comparing the human resources with the other resources: financial, material resources, etc. we see that the human resources have a singular character because of their ability to development and grow, but also because of their ability to discover and overcome their own barriers to deal with the new challenges and exigencies. The human resources are one of the most important investment of the organization. The investment in people has proven to be the safest way to ensure the survival of the organization or to guarantee its competitiveness and perspective.

The paper which is called *The analysis of economic and financial indicators through the human resources management prism*, will address an important theme for the present society, it characterizes by dynamism and continuous renewal, the human resources and the management of these playing a special role.

The research theme can be motivated from the point of view of the role played by the human resources and their professional performances in the favorable realization of any activity. The scientific approach will have as a starting point the reality that the performance, success and competitiveness of the organizations depend to a large extent on the quality and the content of the human resources management.

The paper will be configured in five chapters and subchapters which will present in the chronological order the following aspects: definition and role of the human resources management; human resources management and organization strategy; improvement of the human resources management - a major concern of the management of the Romanian organizations; training and professional performance of the human resources, as well as a case study on the analysis of the economic and financial indicators at a company of distribution of the professional cleaning products.

In the first chapter we will devote an extended space to the issues of defining the concept of human resources management through the numerous authors in the field and the role of the human resources management.

In the chapter two we aim to highlight the elements which are related to the integration of the human resources management in the general policy of the organization and the relation between the human resources management strategy and the strategy of the organization.

In the chapter three, we will discuss about the human resources as the main factor of the production, we will address the issues which are related to the staff management and the staffing in the view of the human resources management, by enumerating the factors that have influenced the staffing over time.

The chapter four will deal with the training and professional performance of the human resources. We will discuss about the peculiarities of the vocational training process, about the four stages of vocational training, the forms and the methods of the professional training.

The chapter five will be devoted to the economic and financial analysis of a distribution company of the professional cleaning products, highlighting the contribution of every department to the overall activity and to the profit of the company.

## **1. Definition and role of the human resources management**

### **1.1. Definitions of the human resources management**

The human resources management is the result of the specialized researches and it had an evolution and a rapid diversified in many areas of activity. The human resources management is the side of the organization management, which starting from the premise that the people and their ability to carry out the different activities, constitutes the important resources, directs and stimulates the human potential in order to achieve the desired performance. The human resources represent the ensemble of employees working in an organization and influence the performance of the tasks through the level of the professional training.

Ivancevich and Glueck (1986) believe that "the human resources management implies a comprehensive, global, interdisciplinary and professional approach of the staff issues within an organization".

The Romanian specialized literature includes a lot of definitions of the human resources management, including:

- it represents a complex of interdisciplinary measures, related to the staff recruitment, selection, employment, use through the ergonomic organization of the labor, the material and moral impulse, until the completion phase of the employment contract;
- the multitude of processes being oriented towards the efficient use of the human resources, in order to meet the organizational objectives, while ensuring the conditions which support the satisfaction of the employees' needs;
- it includes all the activities tending towards the human factor, having as aim: conception, projection, optimal use, maintenance and socio-human evolution.

According to Burlea Şchiopoiu (2008) "the complexity of the human resources management is generated by all the activities which are carried out in this field, such as: foresight and strategic human resources management, selection and recruitment, performances evaluation, motivation and remuneration of the human resources, careers management, management of the working groups. The diversity of the preoccupations in the human resources management field is generated by the human factor - by the specialists and the practitioners which are concerned about the human side of the competitive advantage of the organizations. The human side is based on the fact that the collective intelligence, the complexity of employees' competences and the competition lead to a new resize of the human resources management".

The specialized authors have developed only the operational definitions being needed to highlight their conception about this field and to avoid the confusion about the treatment of the human resources issues. Although these definitions are fair and according with the reality from the point of view of which they have been formulated, some of them can be considered as insufficiently comprehensive compared to the complexity of the human resources management issues. Analyzing the previous definitions, it is noted that there is currently no official definition, a generally accepted, human resources management definition with the agreement of the specialists in the field. The above definitions complement each other, contributing to the delimitation of the content of the human resources management, they do not have the divergent elements.

According to many authors, "Staff Management" and "Human Resources Management" are the same thing, as the staff within the organization represents the human resources of this. However, "Human Resources Management" is a relatively new, more modern term for what has traditionally been called "staff management," "staff admission," "industrial relations," "staff activities management, "employees' development". Table 1 presents comparatively the elements of the human resources management and of the staff management.

Table 1. Elements of the human resources management compared to the staff management

Reference components	Employees Management	Human Resources Management
Behavior	Norms/ Habits	Values/ Mission
Contract	Careful elaboration of the written contracts	„Beyond the contract” action
Model for the managerial action	Procedures	Requirements
Initiatives	Gradually	Integrated
Management qualities	Negotiation	Facility
Decision rapidity	Slow	Rapid
Communication	Indirect	Direct
Categories of jobs	Many	Restricted
Design of the jobs	Division of the labor	Teamwork
Selection	Separate, management activity	Integrated, key activity
Remuneration	Jobs evaluation (fixed graduations)	Depending on the performance
Training and development	Control of the access at the courses	Organizations of training

Source: Goss 1944, 1.

Analyzing this table, it is noted that the human resources management is a unanimously recognized term among those who have the activities in this field, which attempts to clarify the importance of the human resources in order to highlight the elements that distinguish it from the ordinary staff management.

## 1.2. The role of the human resources management

The human resources management has a strategic role, supposing the staff policies achievement at the scale of the whole institution, initiating the new activities and addressing to the changes from the external environment. They must encourage the flexible attitudes and find the ways to accept the change, having a major role in the development of the organization. The human resources are the special human capacity that must be understood, motivated or trained in order to fully involve the employees, to achieve the organizational goals Constantinescu and Nistorescu (2009) consider that "the people with their experience and knowledge are undoubtedly the most precious resource of the organization, but at the same time the most difficult to administer."

The people have the limited physical and intellectual capabilities, but instead they have the ability to create and develop the organizations. The organizations require the staff and at the same time they depend on their efforts. The nature of any organization is the labor of people, and its efficiency and performance are mostly influenced by the behavior of the staff in the organization environment. The strategic value of the human resources is emphasized because they represent, in Bühner's (1994) view, "a critical variable in the success or failure of any organization".

De Cenzo and Robbins (1998) are of the opinion that "all the organizations involve the people, these must ensure the people, earn their services, develop their skills, motivate them for the development levels, and these must ensure that they continue to maintain their attachment to the organization".

The human resources are influenced by the time factor, indispensable to thought, change, manners and habits. Thus, the importance of the human resources and of their management increased with the passage of time and with the emphasis on the need to adapt the organizations to an increasingly competitive and dynamic environment. No matter how strong there is the resistance, the changes of behavior and mentality are inevitable with the changes generally occurring in the system of human values and especially in our system of values. From the point of view of the human resources management, the people must be sought and recruited for the position they can have within the organization and not just to hold the certain viable posts. This is all the more so since, by competing in a constantly evolving company, the increasing obstacles faced by organizations are becoming more and more due to the importance of the human resources and their management, a reality that must be taken into account by the organizations and managers.

Over time, the role of the human resources and their management will increase due to the high degree of involvement and capitalization of the people's capacity, the people who are more interested in increasing the quality of life in general and the professional life, especially the quality that reflects the best their aspirations.

## 2. The human resources management and the organization strategy

### 2.1. The integration of the human resources management in the general policy of the organization

The integration of the human resources management in the general policy of the organization implies the existence of the following elements:

- the organization culture;
- the organization project.

The culture of an organization which represents all the basic rules that a given group invented or developed in order to cope with its problems concerning the external adaptation and the internal integration, in order to ensure the normal functioning of the unit; these rules must be mastered in the way of thinking, action and feeling of each employee. The culture of the organization is thus a product of its history, involving the use of a particular technique; customer respect, cult of quality, achievement of performance, philosophy of the organization, desire for the innovation; team spirit, internal solidarity.

In practice, this cultural ensemble is a binder between the members of the organization staff, amplifying their unity and consistently orienting their efforts towards achieving the goals which are proposed by the firm through a common sense of belonging to the same family.

The organization project represents the synthesis of the economic and social priorities. The organization project precisely defines the purpose and means which are used to achieve the high levels of performance. A project of the organization must include some fundamental requirements, such as:

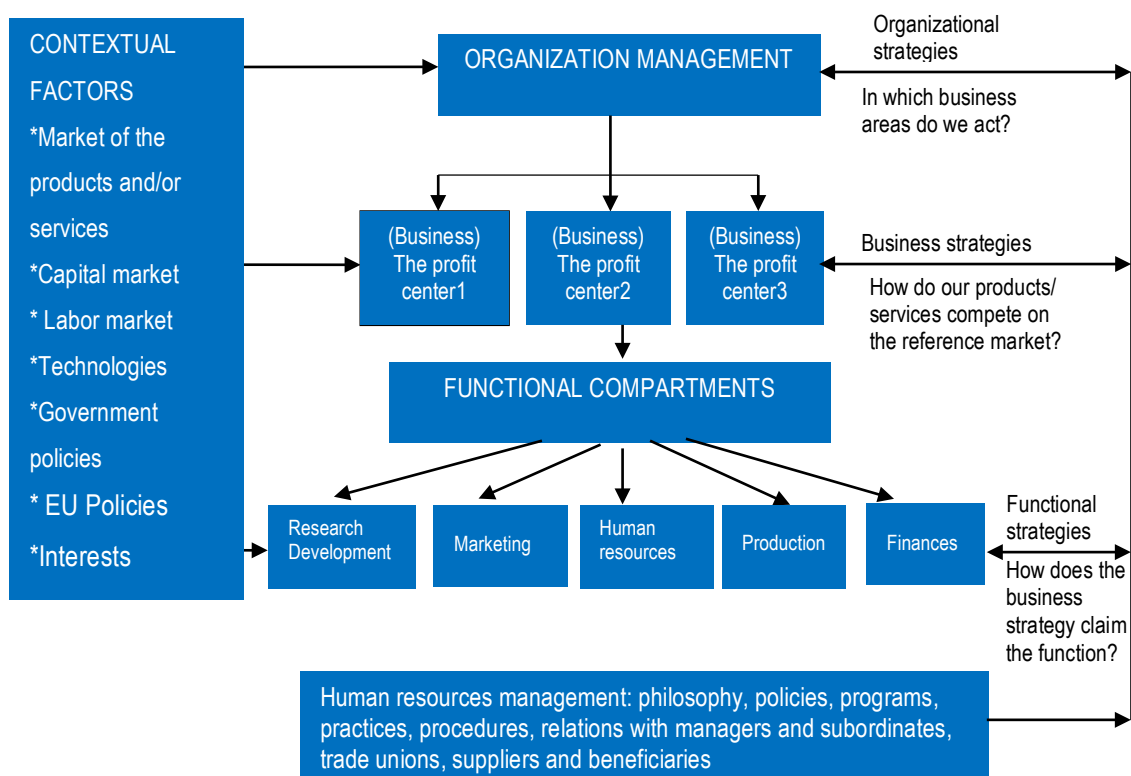
- how the organization deals with different problems;
- how the organization manages to mobilize its own staff;
- how the organization understands to become a reference model for all.

The guidelines which are contained in a project of the organization form the basis for the strategic management of the human resources, contributing to its integration in the general policy of the organization.

## 2.2. The relation between the human resources management strategy and the organization strategy

Bratton and Gold issued two different concepts regarding the relation between the human resources management strategy and the organization strategy, namely: the proactive orientation and the reactive orientation (Bratton, Gold 1999). The proactive orientation highlights the fact that human resources managers and the professionals are committed to formulating the company strategy. This conception is illustrated by the double-sense arrows which represent the top-down and bottom-up influence on the strategy, in the Figure 1.

Figure 1. The relation between the functional strategy of the human resources and the organizational strategy



Source: Bratton, Gold 1999

According to the reactive orientation, the function of human resources management is totally subordinated to the organization strategy, this determining the human resources management policies and practices. In this way,

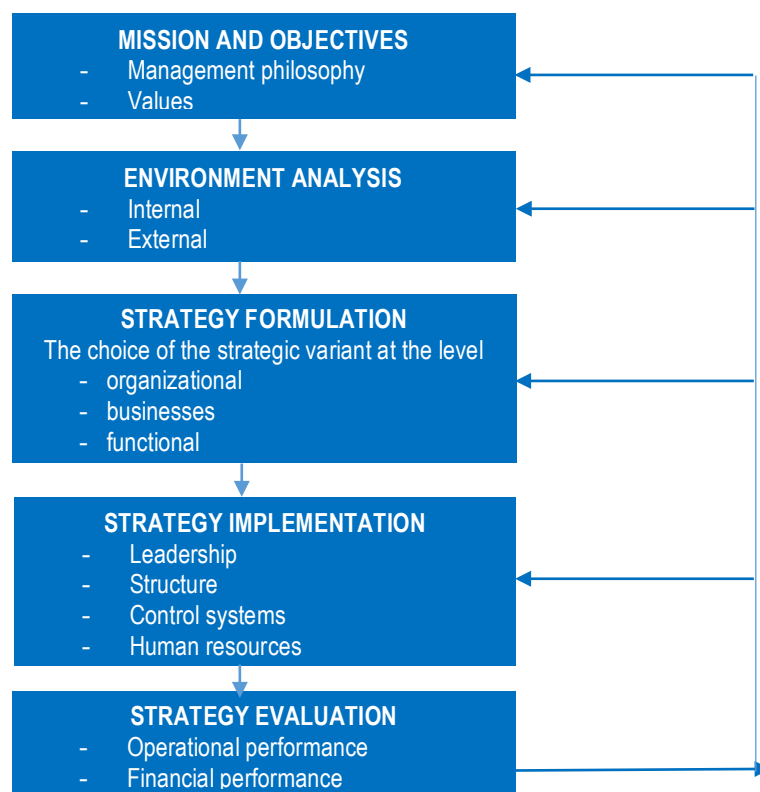
the business strategy is established without the professionals' involvement in the human resources, and the policies and practices of staff are applied for supporting the chosen competitive strategy.

The figure describes the five main activities which are performed by senior management as a linear rational process. This model of the strategic management is a theoretical model that shows how the strategic management should be done and less what the senior managers do. The first step of the model is the superior management assessment of its own positions towards the mission and objectives of the organization. The mission describes the values and aspirations of the organization, its rationality to be. The environment analysis involves, on the one hand, the identification of strengths and weaknesses within the organization, and on the other hand the study of opportunities and arrangements in its external environment.

The strategic factors, called SWOT (Strengths Weaknesses Opportunities Threats), are the most important factors for the future of the organization. The formulation of the strategy aims at assessing by the superior management the interaction of the strategic factors and the choice of the strategic variant, with which the organization can achieve its goals. The strategies can be formulated at the organizational level, at the business level, or at the level of the marketing or human resources functions. The strategy implementation involves the activities which focus on the techniques being used by the managers for implementing the strategy, on the leadership styles, compatible with the chosen strategies, information and control systems, organization structure, human resources management.

The Figure 2 shows the reactive orientation by using one-way arrows from top to bottom, from the business strategy to the strategy from the functional level.

Figure 2. The strategic management model of reactive type



Source: Bratton and Gold (1999)

### 3. The improvement of the human resources management – the major concern of the Romanian organizations management

#### 3.1. The human resources, the main factor of production

The human resources management is the activity responsible for all the actions which affect the relation between the unit and its members, its main purpose being to shape the people and their work in such a way as to obtain the maximum performance. The human resources management recruits, selects, evaluates the employees' performances, defines the posts, the organizational charts, develops the ascending and descending

communication, and this management maintains the professional integrity and the organizational ethics. The human resources or the work potential represent the fundamental component of the national wealth system on which the involvement of all the other subsystems from this system depends (Negulescu 2008, 10).

The capital, as a factor of production, represents all the material and financial means which are destined to the economic activities being necessary for the company; through the use of this capital there are obtained goods, works and services. In this context, the human resource is considered to be one of the most important investments of the unit, the results becoming more and more obvious over time, the human resources constituting a special potential which must be understood, motivated and trained in order to fully involvement in the achievement of the objectives of unity.

The notion of human resource is specific to the human resources management and has the following characteristics:

- it approaches the staff as individualities with specific personality, needs, behaviors and visions;
- the pay is done not according to the done work, but according to the obtained results;
- the performances evaluation becomes a component of the human resources management;
- the employees' initiative becomes real, no longer being considered to be an affecting of the authority of the hierarchical leaders;
- the employees' incentives are supported and promoted through the salary system and the promotion according the competence.

The human resources are a category of perishable resources, reason for which the non-use of these in good time is a social loss which can no longer be recovered.

### 3.2. The staff management and the staffing in the view of the human resources management

The term "staff" is synonymous with the term "employed staff" or salaried staff who is employed in a job and who receives a salary for the performed work. The staff management is oriented on workforce, being directly concerned about the unit employees, employment and training as well as meeting the employees' needs, the staff management acting in the employees' interests.

The specialists in the field appreciate that "the human resources management, like any other scientific field, is the result of the specialized research and it is on the already known trajectory of a relatively rapid evolution and diversification in many fields of activity" (Manolescu 2001, 29). The human resources management is directly concerned about the assurance of the human resource in the unit regarding its planning, supervision and control, being less concerned about the solution of the employees' problems or about the mediation of these problems.

In conclusion, while the staff management takes into account the social side of the human resources of an organization, the human resources management concerns about the organizational side with its economic and social finality, namely the professional performance. Over time, the evolution of staffing was influenced by the economic, technical and sociological factors, as follows:

- *Economic factors.* Under the conditions of uncertainty and economic oscillations, the company must adapt itself through the suppleness and the flexibility of the workforce, being characterized by: professional mobility, adaptability of the qualifications, staff changes and changes of the work schedules according to the outlets which appear on the market. In the companies from the developed countries there is also as an economic aspect the fact that the salaries are not collectively indexed and do not automatically increase in relation to the prices; the economic units are looking to individualize their wages and their performance according to the employees' performances, applying the co-involvement systems in relation to the achieved results. There are very important the negotiations from the company, they showing the main place of the elaboration and implementation of the social policy. The new economic restrictions determined the need for a flexibility concerning staffing, work schedules, individualization of professions and wages, development of the negotiations. These aspects considerably widened the field of the human resources management.

- *Technical factors.* The influence of the technical factors on the evolution of the staff function is also felt through the large investments which are made in a job. These involve the most efficient use for the recovery of the made expenses and thus there is appeared the need to abandon the traditional work methods, after a fixed timetable, and to find the organization solutions of the work: the variable work schedule during the day or the week; the work in three changes; the setting up of the specialized teams for the weekend work. The extent of the concerns in the human resources management field was also determined by the appearance of the socioeconomics. It proposes that the technical changes from a company be based on the prior study of the implications on the human resources and on a human resources action plan that accompanies the application of the new technical solutions. We can say that the technical factors had a big contribution to the evolution of the staff function and to the



constitution of the human resources management through their concerns related to: the evolution of the qualifications, the scientific organization of the work; the existence of over-employees, the organization of the work program; socioeconomic constitution. In conclusion, the human resources management aims at increasing the material potential of the company by capitalization of its human potential.

▪ *Sociological factors.* The various psychosocial analyzes have shown that the relations between the people in their work are extremely varied for at least two reasons: the work itself differs from one employee to another, the diversity of the human motivations. The employee's work can become an agreeable activity for him or, on the contrary, an intrusive activity; it depends on how the company handles two aspects: the content of the work and the work conditions. The individuals' motivations are different, depending on their personality, their aspirations and on personality, socio-educational context, work environment, cultural level and income level. The work itself responds to the very different motivations in relation to those workers. The psychosociological studies had as result an evolution in the content of the work both within the staff compartments and in the other functional compartments of the company, requiring the modification of the management methods and techniques, the transformation of some activities, new forms of work organization. This evolution also marks the transition from the strictly localized framework of the staffing to the human resources management, which concerns the entire company through the prism of its general management.

#### 4. The training and the professional performance of the human resources

##### 4.1. The concept and the components of the professional training

Faced with the new demands of the market economy and the new information challenges, the improvement of the employees' professional training became a sine qua non condition for the employees and the company. The new economic and social context from the recent years increased the preoccupation of the raising units of the level of the employees' professional competencies in order to achieve a maximum efficiency of the performed activity.

Although the employees' professional training is costly enough, it limits the errors by preventing the consequences of the unprepared or inadequately trained employees' poor activities. The concept of professional training includes the vocational training and the professional development. Emilian (1999, 162) points out that "the professional training is a learning / training process whereby the employees acquire the theoretical and practical knowledge, the new skills or techniques that make their work more efficient".

It follows that the professional training involves the accumulation of theoretical and practical knowledge being acquired through the learning and the training, and the professional development involves the acquisition of new skills or techniques having as goal to make that the work be more efficient. The training takes place in the educational institutions being a basic component of the professional training process, with the aim of broadening and updating the knowledge as well as of developing and modeling the skills. The professional training is the process of "the personality modeling in order to create the characteristics to the skills and to the behavior which is necessary for the exercise of an activity" (Roşca 1997, 163). The professional perfecting improves the existing skills and involves the raising of the level of professional training in relation to the degree of technical and technological endowment of the unit" (Roşca 1997, 332).

##### 4.2. The valences and the particulars of the professional training process

The professional training also addresses to the new employees and to those who work for a long time in the company. The professional training must be based on a concrete program, starting from the learners' fair selection, giving the equal opportunities to all employees to improve their performance through this process.

The employees' professional training programs, having as goal the improvement of the qualitative parameters of the workforce, increase its role, making the most efficient the material potential, with the ultimate goal of increasing the profitability of the unit. The assurance of the essential conditions for capitalizing all the existing production factors from the micro and macroeconomic level is made by increasing the quality of the workforce.

The continuous improvement of the workforce as well as the professional training represent the main way of capitalizing on the human factor, using the capacity of creation, innovation, using the human being's skills, experience, in order to prevent the moral wear and tear of the professional, cultural and scientific knowledge of the staff. The well-trained employees, regardless of the function they perform within the unit, there is preferred and paid accordingly every unit which knows well its interests and supports and encourages that the employees be motivated for the self-improvement.

The action of the professional training of the staff is perceived as a mean of increasing and improving the performance of the unit, the professional training being subject to a cost-effectiveness process. The unit decides and establishes the necessity of the training activity, determines the way of performance, the employees who

benefit of the effects of the professional training can enrich the knowledge accumulated during their entire professional life. The professional training actions are set at certain time intervals, depending on the concrete needs of the unit, addressing only to the employees who need training and professional training.

#### 4.3. The stages of the professional training

The systemic approach of the employees' training implies:

- the identification of the training needs by analyzing the steps that aim to establish the weaknesses in the analyzed activity, the poor performance and the poor quality of the services, the knowledge which is necessary for the improvement of the individual performances;
- the design of the professional training which happens after the previous analysis and which aims the adoption of some decisions and methods which will be used in the training process. The objectives of the professional training can be grouped into training objectives, organizational objectives as well as in objectives at the individual level;
- the development/implementation of the training programs is made by establishing the collaboration with the specialized companies in the employees' training achievement;
- the evaluation of professional training programs is the process by which the effectiveness of training programs is assessed in relation to the identified needs, the results of the evaluation leading to the measures for improving the next stages of program deployment or to the introduction of new programs.

#### 4.4. The forms and the methods of the professional training

Olaru defines the learning process as "the complex process of acquiring new ways of appropriate behavior in new situations, engaging in the existing behaviors and appearing as the body matures" (in Roșca 1997, 212-213).

The goal of the learning is to continuously adapt the individual to the changing conditions of the environment, the result of learning being a new response, a faster, more efficient behavior, with few errors and a minimal effort. The learning process has been taking place since the early years, in the primary, secondary, vocational school, in the faculty, in the active life and in the continuing education. The professional training programs suppose the choice of appropriate forms and methods to achieve the proposed goals.

The forms of professional training can be grouped into two categories:

- the procedures through practice or non-formalized procedures that constitute a major way of learning through work being accessible and practiced by any employee, regardless of the type of activity he performs or regardless of the hierarchical level;
- the formalized procedures that take place through the organized courses and are the core subject of the professional training process.

The professional training at the workplace is mainly addressed to the execution functions and it is done through training, apprenticeship or laboratory training. The out-of-work professional training addresses in particular to coordination functions, guidance functions and decision-making functions, the training forms and methods meeting the training or development needs.

### 5. The case study on the analysis of the economic and financial indicators of a company of the distribution of professional cleaning products

#### 5.1. The sales analysis on company departments

Two young managers associated and constituted a company of distribution of the professional cleaning products such as vacuum cleaners, cleaning machines and carts, professional mops and wipers, toiletries, professional detergents. For the distribution of these products, 18 people are employed, whose tasks include the products management and the driving of vehicles.

The poll being conducted by both the population and institutions which require the rigorous hygiene allowed them to orient their product groups for ensuring their delivery with promptness and avoiding the creation of stocks of hard-to-sell products. The analyzed company focuses its activity on three departments: vacuum cleaners and cleaning machines, professional detergents, cleaning materials, which contribute differently to the achievement of economic and financial indicators. The contribution of these departments can be found in the Table 2.

Table 2. Economic data of the company for the years 2017-2018

Monthly sales	Departments					
	Vacuum cleaners and cleaning machines		Professional detergents		Cleaning materials	
	2017	2018	2017	2018	2017	2018
January	95.000	115.000	40.000	35.000	13.000	8.000
February	108.000	118.000	22.000	11.000	17.000	14.000
March	115.000	123.000	30.000	49.000	20.000	15.000
April	117.000	119.000	42.000	72.000	21.000	14.000
May	120.000	142.000	65.000	87.000	20.000	16.000
June	121.000	138.000	103.000	120.000	21.000	17.000
July	124.000	139.000	126.000	135.000	20.000	16.000
August	105.000	120.000	115.000	112.000	20.000	13.000
September	119.000	129.000	137.000	122.000	22.000	17.000
October	124.000	144.000	129.000	129.000	27.000	20.000
November	125.000	145.000	135.000	146.000	15.000	11.000
December	140.000	150.000	100.000	151.000	10.000	10.000
TOTAL	1.413.000	1.582.000	1.044.000	1.169.000	226.000	171.000

In the Table 3 we will determine the share of every department at the company achievements.

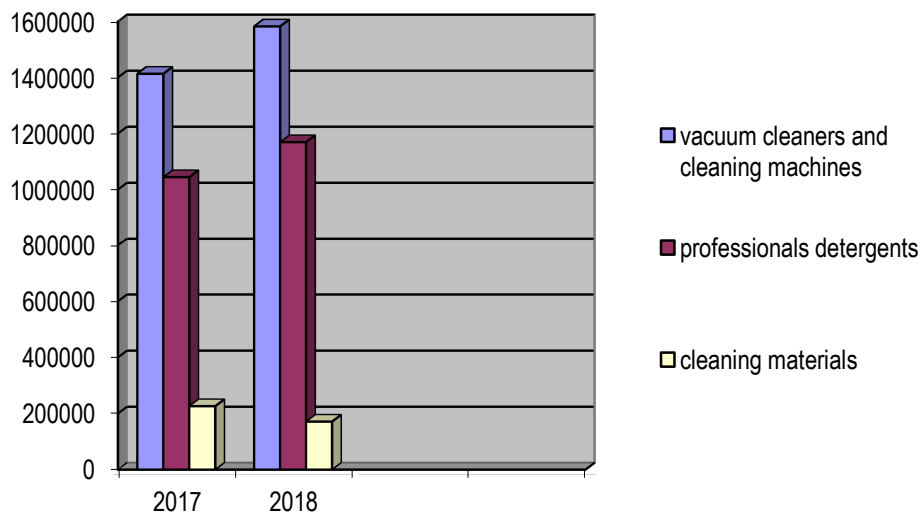
Table 3. Share of the departments in the company activities

Department	2017		2018	
Vacuum cleaners and cleaning machines	1.413.000	53%	1.582.000	54%
Professionals detergents	1.044.000	39%	1.169.000	40%
Cleaning materials	226.000	8%	171.000	6%
TOTAL	2.683.000	100%	2.922.000	100%

The graphic rendering of the above is illustrated in the Figure 3. The contribution of every department is also highlighted at the level of the months of the years 2017 and 2018. In the year 2017, the company monthly sales were as follows:

- January 148.000 lei (vacuum cleaners and cleaning machines 95.000, professional detergents 40.000, cleaning materials 13.000 lei);
- February 147.000 lei (vacuum cleaners and cleaning machines 108.000, professional detergents 22.000, cleaning materials 17.000 lei);
- March 165.000 lei (vacuum cleaners and cleaning machines 115.000, professional detergents 30.000, cleaning materials 20.000 lei);
- April 180.000 lei (vacuum cleaners and cleaning machines 117.000, professional detergents 42.000, cleaning materials 21.000 lei);
- May 205.000 lei (vacuum cleaners and cleaning machines 120.000, professional detergents 65.000, cleaning materials 20.000 lei);
- June 245.000 lei (vacuum cleaners and cleaning machines 121.000, professional detergents 103.000, cleaning materials 21.000 lei);
- July 270.000 lei (vacuum cleaners and cleaning machines 124.000, professional detergents 126.000, cleaning materials 20.000 lei);
- August 240.000 lei (vacuum cleaners and cleaning machines 105.000, professional detergents 115.000, cleaning materials 20.000 lei);
- September 278.000 lei (vacuum cleaners and cleaning machines 119.000, professional detergents 137.000, cleaning materials 22.000 lei);
- October 280.000 lei (vacuum cleaners and cleaning machines 124.000, professional detergents 129.000, cleaning materials 27.000 lei);
- November 275.000 lei (vacuum cleaners and cleaning machines 125.000, professional detergents 135.000, cleaning materials 15.000 lei);
- December 250.000 lei (vacuum cleaners and cleaning machines 140.000, professional detergents 100.000, cleaning materials 10.000 lei).

Figure 3. The graphical representation of the share of the departments in Line Group SRL



In the year 2018 the company recorded the following monthly sale:

- January 158.000 lei (vacuum cleaners and cleaning machines 115.000, professional detergents 35.000, cleaning materials 8.000 lei);
- February 143.000 lei (vacuum cleaners and cleaning machines 118.000, professional detergents 11.000, cleaning materials 14.000 lei);
- March 187.000 lei (vacuum cleaners and cleaning machines 123.000, professional detergents 49.000, cleaning materials 15.000 lei);
- April 205.000 lei (vacuum cleaners and cleaning machines 119.000, professional detergents 72.000, cleaning materials 14.000 lei);
- May 245.000 lei (vacuum cleaners and cleaning machines 142.000, professional detergents 87.000, cleaning materials 16.000 lei);
- June 275.000 lei (vacuum cleaners and cleaning machines 138.000, professional detergents 120.000, cleaning materials 17.000 lei);
- July 290.000 lei (vacuum cleaners and cleaning machines 139.000, professional detergents 135.000, cleaning materials 16.000 lei);
- August 245.000 lei (vacuum cleaners and cleaning machines 120.000, professional detergents 112.000, cleaning materials 13.000 lei);
- September 268.000 lei (vacuum cleaners and cleaning machines 129.000, professional detergents 122.000, cleaning materials 17.000 lei);
- October 293.000 lei (vacuum cleaners and cleaning machines 144.000, professional detergents 129.000, cleaning materials 20.000 lei);
- November 302.000 lei (vacuum cleaners and cleaning machines 145.000, professional detergents 146.000, cleaning materials 11.000 lei);
- December 311.000 lei (vacuum cleaners and cleaning machines 150.000, professional detergents 151.000, cleaning materials 10.000 lei).

From the above it results that the department "the vacuum cleaners and the cleaning machines" is maintained in the two analyzed years, with the greatest contribution to the activities of the company, followed by the department "the professional detergents", and on the last place there is the department "the cleaning materials". This situation is true both at the annual and monthly intervals.

## 5.2. The profit analysis for the years 2017-2018

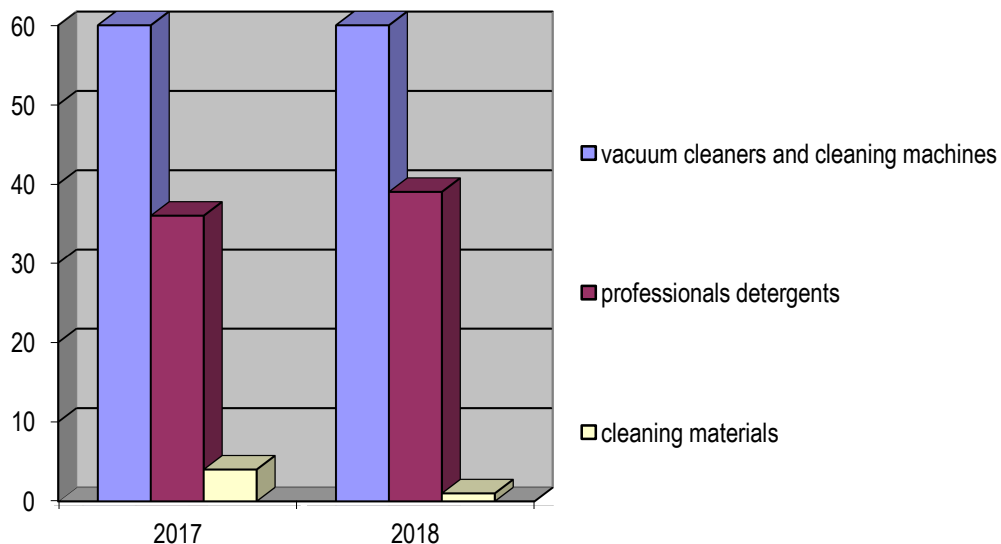
The goal of any society is to make the profit. In order to highlight to what extent the analyzed company reached its goal, we used the Table 4 and analyzed the resulted data.

Table 4. The company profit for the years 2017-2018

Departments	Annual profit		Differences
	2017	2018	
Vacuum cleaners and cleaning machines	232.678	244.617	11.939 (>5%)
Professionals detergents	139.607	159.001	19.394 (>14%)
Cleaning materials	15.512	4.077	11.435 (<74%)
TOTAL	387.797	407.695	19.898 (>5%)

The figures from the previous table are graphically represented in the Figure 4.

Figure 4. The profit on departments in the years 2017-2018



Next, we will make an economic analysis for the two years. In 2018, the total profit exceeds the total profit of almost 20.000 lei from the previous year. By groups of activities the situation is differentiated, as follows:

- in the "vacuum cleaners and cleaning machines" department, the profit which expressed in percentage is at a level which is similar with the one from the company level, registering a 5% increase;
- the most important increase is achieved in the professional detergents department - 14%. This is due to the fact that the company gained an important place on the market, expanding its scope and making the new customers;
- a significant decrease of the profit was achieved in 2018 in the cleaning materials department as a result of the appearance on the market of new products that the company acquired, but it was not convincing enough for the traditional customers to use them

By analyzing the obtained profit dynamically, the management of the company is relatively content of the results and it aims to increase the activity of promotion of the new materials, so that the beneficiaries of the services will appreciate them and demand them with insistence in the near future.

## Conclusions

Starting from the importance of the human resources management for the company, in the current paper with five chapters, we studied the human resources management issues and we realized a case study about the economic and financial analysis of a company of distribution of the professional cleaning products.

In the first chapter we addressed the issues being related to the definition and role of the human resources management. The definitions of the concept of the human resources management in the specialists' vision in the field contributed to the delimitation of the content of the human resources management. From the analysis of these definitions, we observe that the human resources management covers all the activities being achieved by the organization leadership concerning staff recruitment, selection, employment, efficient use of the human resources, their material and moral support, professional performance evaluation.

We continue to highlight the specific elements for the human resources management, which distinguish it from the ordinary staff management. The development of theory and practice in the field of the human resources

management presupposes the perfect knowledge and understanding of the role and particularities of the human resources within the organization. The human resources are an important investment of the organizations, with the visible results over time.

Through the chapter two we tried to make known the elements on which the integration of the human resources management depends in the general policy of the organization: the organization culture and the organization project, and those related to the relation between the human resources management strategy and the organization strategy. There are two conceptions about the relation between the human resources management strategy and the organization strategy being formulated by Bratton J. and Gold J., namely: the proactive orientation and the reactive orientation. According to proactive orientation, the human resources managers and professionals are committed to formulate the company strategy. This conception was illustrated by a figure which highlights the relation between the functional strategy of the human resources and the organizational strategy being elaborated by the above-mentioned authors.

The reactive orientation highlights that the human resources management function is totally subordinated to the organization strategy, this determining the human resources management policies and practices. In this context, the business strategy is set without the professionals' involvement in the human resources, and the staff policies and practices are applied to support the chosen competitive strategy. The reactive orientation was rendered graphically through the reactive-type strategy model describing the five main activities which are performed by the superior management as a linear rational process.

In the chapter three we first talked about the human resources as the main factor of production and we listed the characteristics of the human resource notion. Then we described the factors that determined the evolution of the staff function, namely: the economic factors, the technical factors, the sociological factors.

The chapter four dealt with the training and professional performance of the human resources. We discussed about concept and components of the professional training, peculiarities of the professional training process, stages of the professional training, methods and forms of professional training: the unformalized procedures and the formalized procedures.

In the chapter five we made a case study concerning the analysis of the economic and financial indicators of the company of distribution of the professional cleaning products. We conducted a sales analysis of the three departments of the company: "vacuum cleaners and cleaning machines", "professional detergents", "cleaning materials", specifying the contribution of every department to the economic and financial indicators, for the years 2017 and 2018 and for the months related to these years as well as the share of the three departments at the overall activity of the company, being illustrated also in graphical form.

From the above we find that the department "vacuum cleaners and cleaning machines" has the largest contribution to the activities of the company during the two analyzed years. We also realized the comparative analysis on departments of the profit of the years 2017-2018, highlighting the differences between the two years, what results from the contents of the Table 4 and the Figure 4. From the made analysis we can see that in the year 2018, the company obtained a higher profit of 5% than in the year 2017.

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## Performance of Supply Chain Management for Sumbawa Forest Honey in Indonesia

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### Abstract:

The performance of supply chain management is an activity in the management of production goods from the start of supply until it is ready to reach consumers. The problem in this study is the uncertainty of Sumbawa forest honey supply, because it depends on nature. The price of forest honey is also expensive, because of the far-reaching and difficult extraction in the forest. Shipping costs to consumers are expensive too. Quality is also a problem, because the quality of Sumbawa forest honey is not always the same. The purpose of this study was to analyze the performance of supply chain management of Sumbawa forest honey. The samples in this study were 110 respondents. The data used was primary data. Data were analyzed using SEM (Structural Equation Modeling) analysis, with WarpPls measurement tools. The results of the study found that not all variables directly influenced the supply chain performance. The affecting variables were the performance of procurement and distribution of production facilities. The variables that directly impacted on the performance of the Sumbawa forest honey supply chain were the performance of procurement & distribution production facilities, performance of sales, and performance of supporting institutions with path coefficient of -0.14\*, 0.84\*\*\* and -0.18\*\*, respectively.

**Keywords:** performance; supply chain management; Sumbawa forest honey; SEM; WarpPls.

**JEL Classification:** B55; D47; P17; Q13.

### Introduction

Sumbawa forest honey is the honey originating from forest of Sumbawa, West Nusa Tenggara, Indonesia. It is produced by honey bee (*Apis dorsata*). It can only be collected in forest area because the insect cannot be artificially reared. The business of forest honey requires the hygienic and continuous production, with pre-required certain water content for market (Maryani *et al.* 2013). The good quality for honey is indicated with the water content of 22% (SNI 01-3545-2004).

Mensah *et al.* (2017) stated that the potential of supply for honey resources in the forest could contribute to increase the availability of space and time resources as the location for management of honey bee. The

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conservation efforts have to specifically orientate for plant species of honey bee to conserve and increase their potential in maintaining the population of honey bee.

The supply of Sumbawa forest honey depends on nature. Its price is quite expensive due to its far collecting process (should from the forest as the insect cannot be cultivated) and its high shipping cost to the location (final location/spot of sale to consumers). The further problem is the its questionable quality whether the produced honey is good or not. The great demands of this honey need the supply and proper management to meet the necessity of consumers. The mechanism of supply chain is the collaboration and coordination among actors of supply chain from upstream to downstream. The flow pattern of supply chain consisting of flow of raw materials, flow of products as well as financial and information flows should be well and smoothly run (Timisela *et al.* 2014). The businessmen in a supply chain should be able to provide the appropriate products (in terms of quality, quantity, price, time and proper location) for consumers (Furqon 2014). Therefore, this study conducted to analyze the performance of supply chain management for Sumbawa forest honey in West Nusa Tenggara, Indonesia.

## 1. Literature review

### 1.1. Supply chain management

Furqon (2014) summarized that supply chain was the whole integrated activities including the information flow associated with aspects of source, production process and the process of product delivering. There are three components in supply chain, namely:

- Upstream supply chain, including some activities of company with distributor, such as supply of raw and accompanying materials;
- Internal supply chain, comprising of all introduction process of items into the warehouse which are used on production process. The main activities are production and stock control;
- Downstream supply chain, consisting of all activities involving product shipment to consumers. Its main focused activities are distribution, warehousing, transportation and service.

The Council of Supply Chain Management Professionals (CSCMP), in Mentzer *et al.* (2008), defined the developed supply chain management, namely:

- Supply chain management including the planning and management of all activities involving resources and supply, processing and all activities of logistic management;
- Supply chain management consisting of planning and management of all activities involving resources and supply, processing, demand fulfilment, and all activities of logistic management.

Supply chain management is a system involving production, shipment, storage, distribution and product sale processes in order to fulfil the demand of those products (Wuwung 2013). It included all involved process and activities in product delivering to consumers. Supply chain management is a unity of market system covering the integration among the businessmen so that it can satisfy the consumers. The implementation of supply chain management includes the introduction of supply chain member and whom they communicate with, the conducted process on each relationship among businessmen of supply chain (Salsabila *et al.* 2014).

Supply chain management is a skill in shipment process of its own product, particularly those are related to pending problem and uncertainty in time, quality, and service availability as well as risk. Logistics is part of this flow and the limitations of main resources in agricultural supply chain are the smoothness, time accuracy and item quality (Sanjaya and Perdana 2015). The production agricultural flows process according to Sisto (2019) consist of phase, namely: storage milling, making of pasta, and the marketing of the finished product.






### 1.2. Structural equation modeling

SEM (Structural Equation Modeling) is one types of multivariate analysis of applied statistics method to analyze some research variables simultaneously and holistically (Sholihin and Ratmono 2013). Solimun *et al.* (2017) described the characteristics of multivariate analysis, *i.e.*:

- Multivariate analysis is used on experiment involving multivariables which are simultaneously and holistically observed.
- Multivariate analysis simultaneously analyze data (its variables have related characteristics each other).
- Multivariate analysis is the interpretation of analysis result which is comprehensively conducted (the obtained information is more complete and more comprehensive).

Sarwono (2010) noted that SEM had symbol notation which should be understandable, as presented in Table 1.

Table 1. Symbol notation of Structural Equation Modeling (SEM)

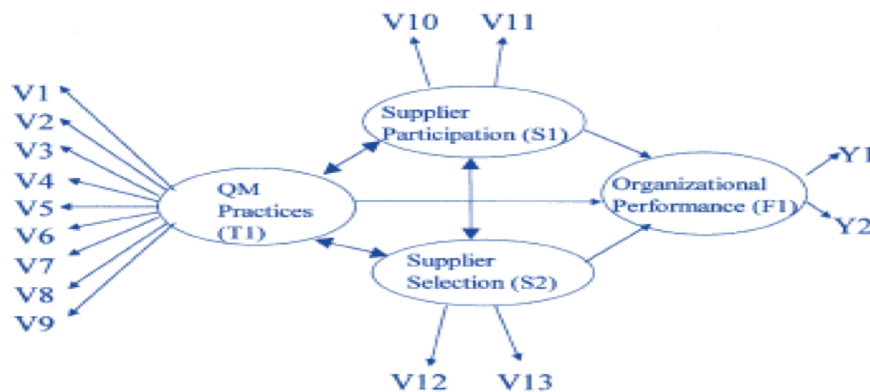
Symbol notation	Description
	Non observation/latent/independent/factor variables.
	Observation/indicator/manifest variables.
	Showing the effect of one variable to others.
	Showing covariant/correlation among a pair of variables.
	Measurement and residual error.

Source: Sarwono (2010).

Table 1 described symbol notations in SEM analysis, namely non observation/latent/independent/factor variables, observation/indicator/manifest variables, showing the effect of one variable to others, showing covariant/correlation among a pair of variables, as well as measurement and residual error.

Path diagram of SEM analysis functioned to exhibit the pattern of relationship among variables, i.e. observation, latent and indicator variables (Sarwono 2010). Lin *et al.* (2005) investigated the quality of supply chain management and performance of organization. This research was analyzed using SEM method, with some variables such as quality management practice (T1), participation of supplier (S1), selected supplier (S2) and performance of organization (F1). Figure 1 is the path diagram of SEM analysis in experiment of Lin *et al.* (2005).

Figure 1. Path chart analysis structural equation modeling (SEM)



Source: Lin *et al.* 2005

Figure 1 illustrated the path diagram of SEM analysis with some variables, namely: T1 (quality of management practice), S1 (participation of workers), S2 (selection of workers), F1 (performance of company organization). V1 (top management), V2 (training), V3 (product design), V4 (quality management of service), V5 (process management), V6 (quality of data reporting), V7 (correlation with workers), V8 (correlation with consumers) and V9 (training in providing company icon), which are constructs of variable T1. V10 (participation of workers in product design) and V11 (workshop) are constructs of variable S1. V12 (quality orientation of workers) and V13 (orientation of price determination) are constructs of variable S2. Y1 (satisfaction level of business) and Y2 (business yield) are constructs of variable F1.

## 2. Methodology

### 2.1. Sample

There were 110 samples used in this research which were determined with snow ball method. It was a multistage technique based on analogy of snow ball, started with the small snow ball and then enlarging subsequently due

to the addition of snow when it was rolled on snow overlay. It was initiated with the early identification of people or case corresponding to research criteria, and then continued with direct linkage relationship in a network to find the next respondents or samples (Nurdiani 2014).

## 2.2. Data collection

The data used were primary and secondary data. was conducted in Sumbawa, West Nusa Tenggara, Indonesia.

## 2.3. Data analyzed

Data were analyzed with SEM (Structural Equation Modeling) using of WarpPLS. Pls model represented an approach based on structural equation modeling components, which was suitable for small samples (Dávilla-Aguirre *et al.* 2014). The initial calculation of the questionnaire was conducted using Likert's scale. This experiment used closed statement with the range of assessment 1-5.

The results from calculation of Likert's scale were then analyzed using WarpPLS software. The use of WarpPLS software was described by these following steps (Solimun *et al.* 2017):

- *first step*: planning inner model (creating the relationship among latent variable). Latent variable is an unmeasurable variable and a construct which should be measured with indicator (Sholihin and Ratmono 2013).
- *second step*: planning outer model (determining whether the variable has reflective or formative indicator).
- *third step*: determining variables and indicators from supply chain management of Sumbawa forest honey (Table 2).

Table 2. Variable data on performance of supply chain management of Sumbawa forest honey

No.	Variable	Indicator
1	Performance of procurement & distribution production facilities (x1)	x11 - Performance in making a purchase; x12 - Inventory manager performance; x13 - Performance in evaluating suppliers; x14 - Performance in negotiations; x15 - Scheduling delivery performance.
2	Performance of processing (x2)	x21 - Storage performance; x22 - Performance in sorting; x23 - Performance in packaging; x24 - Performance in installing labels/brands.
3	Performance of sales (x3)	x31 - Performance in setting prices based on product quality; x32 - Performance in product efficiency; x33 - Performance in determining sales cooperation contracts.
4	Performance of supporting institution (x4)	x41 - Performance of farmer groups; x42 - Performance of credit institutions; x43 - Performance of research institutions; x44 - Performance of training institutions.
5	Performance supply chain (y)	y1 - Quantity of results; y2 - Quality of results; y3 - Timeliness of results; y4 - Ability to work together.

Table 2 explained the variables on performance of supply chain management of Sumbawa forest honey. The first variable, namely: performance of supply and distribution of production tools (x1), was reflected by some indicators, *i.e.* x11 (performance in buying), x12 (performance of supply management), x13 (performance in evaluating supply), x14 (performance in negotiating) as well as x15 (performance in scheduling shipment).

The second variable was performance of processing (x2), reflected by indicators of performance of storage (x21), performance of sorting (x22), performance in packaging (x23), and performance in labelling (x24). Performance of sales (x3) was the next variable, which was reflected by indicators of performance in establishing based on product quality (x31), performance of product efficiency (x32), and performance in determining the contract of sale cooperation (x33).

The fourth variable, such as performance of supporting institution (x4), was reflected by indicators of performance of farmer's group (x41), performance of financial institution (x42), performance of research institution (x43), and performance of training institution (x44). The last variable was performance of supply chain

(y), which was reflected by indicators of yield quantity (y1), yield quality (y2), time accuracy of yield (y3) as well as capability of cooperating (y4).

Fourth step: variables in Table 2, then constructed in path diagram (see Figure 2).

Figure 2. Constructed path diagram of performance supply chain management for Sumbawa forest honey

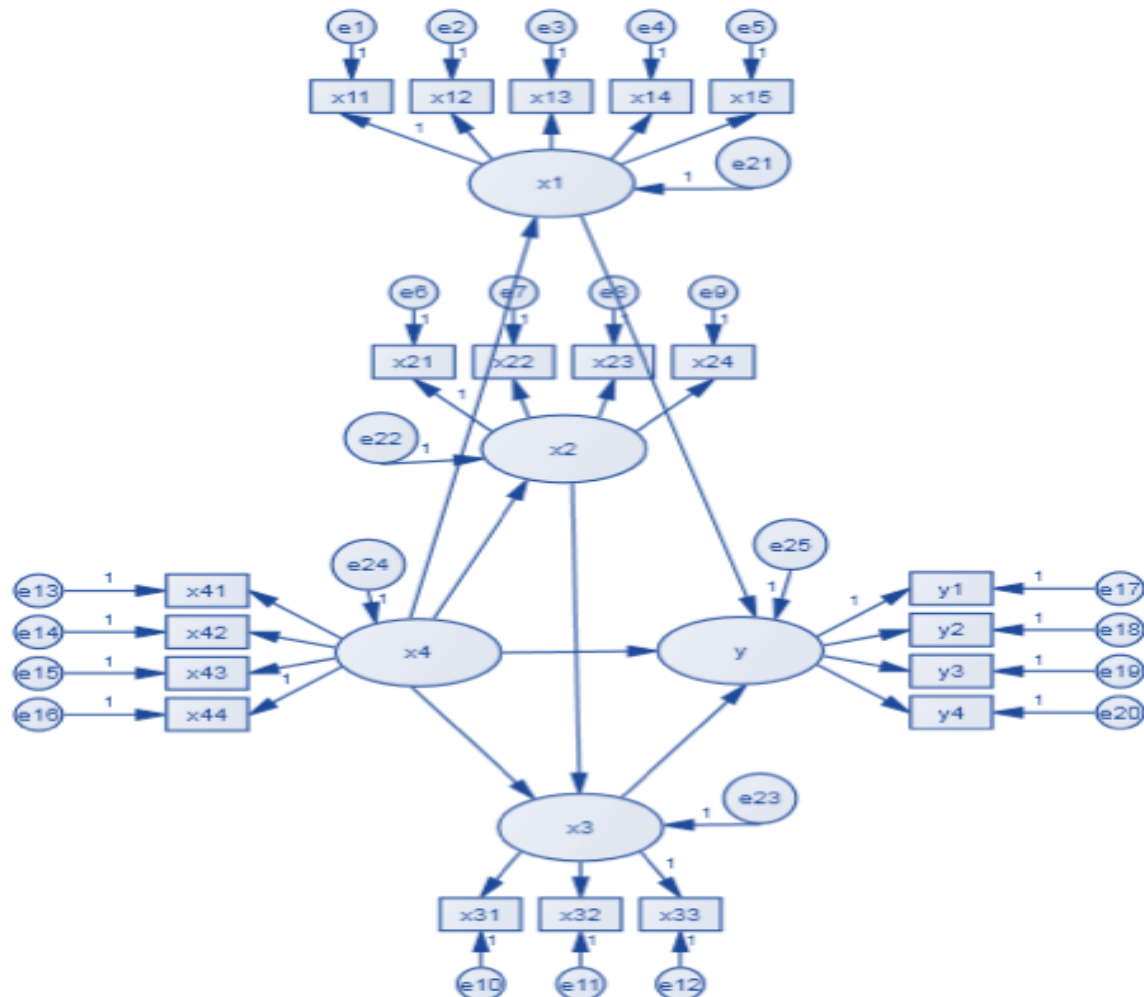


Figure 2, exhibited that performance on supply chain of Sumbawa forest honey (y), directly affected by performance of supply and distribution of production tools (x1), performance of sales (x3) as well as performance of supporting institution (x4). Indirect effect occurred on performance of processing (x2) against performance of supply chain (y), through performance of sales (x3).

### 3. Result and discussion

#### 3.1. Validities and reliabilities

Solimun *et al.* (2017) stated that questionnaire could be considered as discriminant valid if the square root of Average Variance Extracted/AVE (value on diagonal column in parentheses was higher that correlation among latent variable on the same column). Reliability was recognized with the value of composite reliability > 0.70. Validity of discriminant and realibility of questionnaire was presented in Tables 3 and 4.

Table 3, showed that the validity of variable x1 had been met with the root of AVE was about 0.758. It was higher than other latent variables on the same column, *i.e.* x2, x3, x4 and y with the values of 0.436, -0.153, 0.419 and -0.004, respectively. Validity of variable x2 has been also reached with the root of AVE around 0.674, which was higher than other latent variables on the similar column, such as x1, x3, x4 and y with corresponding values of 0.436, 0.031, 0.550 and -0.335, respectively. Validity of variable x3 has been fulfilled by the root of AVE about 0.901. It was higher than other latent variables on the same column, namely x1, x2, x4 and y with -0.153, 0.031, 0.529 and 0.398, respectively. Validity of variable x4 has been met with the root of AVE around 0.786,

which was higher than other latent variables in the similar column, *i.e.* x1, x2, x3 and y with the values of 0.419, 0.550, 0.529 and -0.135, respectively. Validity of variable y has been reached with the root of AVE about 0.816. It was higher than those of other latent variables, such as x1, x2, x3 and x4 with corresponding values of -0.004, -0.335, 0.396 and -0.135, respectively.

Table 3. Validity of root discriminant of AVE and coefficient of correlation

	x1	x2	x3	x4	Y
x1	(0.758)	0.436	-0.153	0.419	-0.004
x2	0.436	(0.674)	0.031	0.550	-0.335
x3	-0.153	0.031	(0.901)	0.529	0.396
x4	0.419	0.550	0.529	(0.786)	-0.135
Y	-0.004	-0.335	0.398	-0.135	(0.816)

Source: processed data, 2019

Table 4, revealed that composite reliability of variables x1, x2, x3, x4 and y were 0.854, 0.728, 0.927, 0.856, and 0.885, respectively. All those values were higher than 0.70, so that the requirement for their reliability has been reached.

Table 4. Composite reliability

	x1	x2	x3	x4	Y
Composite reliability	0.854	0.728	0.927	0.856	0.885

Source: processed data, 2019

### 3.2. Description of research variables

Performance on supply chain management of Sumbawa forest honey in this research was the performance on supply chain management of Sumbawa Forest Honey Network (JMHS). There were five variables, such as performances of supply and distribution of production tools (x1), processing performance (x2), sales performance (x3), supporting institution performance (x4) and supply chain performance (y).

Performance of supply and distribution of production tools was assessed with five indicators, namely: performances in buying forest honey from hunters (x11), in managing supply (x12), in evaluating the supplier of forest honey (x13), in negotiating (x14) and in scheduling shipment (x15). Performance of processing (x2) was measured with four indicators, *i.e.* performances in storing forest honey (x21), in sorting (x22), in packaging (x23), in labeling (x24). Performance of sales (x3) was assessed with three indicators, such as performances in establishing price according to product quality (x31), in product efficiency (x32), in determining the contract of product cooperation (x33). Performance of supporting institution (x4) was measured with four indicators, namely: performances of farmer's group (x41), of financial institution (x42), of research institution (x43) and of training institution (x44). Performance on supply chain of Sumbawa forest honey (y) was assessed with four indicators, *i.e.* yield quantity (y1), yield quality (y2), time accuracy of yield performance (y3), capability of cooperating (y4).

Description of variables was used to figure out the experienced conditions by business of Sumbawa forest honey, whether under good condition or not, using calculation of class interval (highest and lowest score were 5 and 1, respectively). The criterion for assessment on description of variables were listed as below (Solimun *et al.* 2017):

- a) - 1.5 = lowest /worst
- b) 1.5 > - 2.5 = low/worse
- c) 2.5 > - 3.5 = middle
- d) 3.5 > - 4.5 = high/good
- e) 4.5 > = highest/best

Description of variables on respondents of performance on supply chain management of Sumbawa forest honey was presented in Tabel 5.

Table 5. Description of variables on performance of supply chain management of Sumbawa forest honey

Variable	Indicator	Frequency					Mean	Variable mean
x1	x11	0	0	20	80	10	3.91	3.78
	x12	0	0	10	90	10	4.00	
	x13	0	0	60	50	0	3.45	
	x14	0	0	20	90	0	3.82	
	x15	0	0	30	80	0	3.73	
x2	x21	0	0	30	80	0	3.73	4.11
	x22	0	0	0	100	10	4.09	
	x23	0	0	0	50	60	4.55	
	x24	0	0	0	100	10	4.09	
x3	x31	0	0	10	100	0	3.91	4.06
	x32	0	0	20	30	60	4.36	
	x33	0	0	10	100	0	3.91	
x4	x41	0	0	10	40	60	4.45	4.27
	x42	0	0	10	100	0	3.91	
	x43	0	0	10	50	50	4.36	
	x44	0	0	0	70	40	4.36	
Y	y1	0	0	60	50	0	3.45	3.64
	y2	0	0	60	50	0	3.45	
	y3	0	0	30	80	0	3.73	
	y4	0	0	10	100	0	3.91	

Source: processing data, 2019

The best performance on supply chain management of Sumbawa forest honey was shown by supporting institution (x4), with the highest average of 4.27. This performance consisted of those from farmer's group, research institution, training institution as well as financial institution. They were associated institutions for assisting in the smoothness of process of marketing management for Sumbawa forest honey.

The next best performance was indicator x2, *i.e.* performance of processing, with the mean of value about 4.11. This performance included those in storing, sorting, packaging and labeling. It should be well and neatly conducted, so that it could generate high quality and valuable products. The third performance was indicator x3, namely performance of sales, with the averages of 4.06. It involved the performances in establishing appropriate price with quality of Sumbawa forest honey, in product efficiency as well as in determining the contract of cooperation with supplier. The next was performance of supply and distribution of production tools (x1), with the value of 3.78. It comprised of the performances in buying Sumbawa forest honey from supplier, in managing supply of Sumbawa forest honey, in evaluating supplier, in negotiating and in scheduling shipment of supply for Sumbawa forest honey. The last was performance of supply chain (y), with the average of 3.64. It consisted of performance in evaluating yield quantity, time accuracy for all activities and capability of cooperating.

The average value of each indicator exhibited that all indicators were in good conditions. Such conditions should be continuously developed and revised for sustainable performance on supply chain management of Sumbawa forest honey.

### 3.3. Variable profile

Profile of variables was the integration of important identifying indicators according to value of factor loading, with the empirical condition of a variable based on average values (Solimun *et al.* 2017). The getting higher factor loading indicated that those indicator variables was getting important. Profile variables of x1, x2, x3, x4, and y was presented in Tables 6, 7, 8, 9, and 10.

Table 6. Profile of variables on performance of supply and distribution of production tools (x1)

No.	Indicator	Factor loading	Mean of score
1	x11	0.874	3.91
2	x12	0.870	4.00
3	x13	0.146	3.45
4	x14	0.854	3.82
5	x15	0.779	3.73

Source: processed data, 2019

Table 6, showed that factor loading and highest average scores of variable x1 (performance of supply and distribution production tools) were indicator x11 (performance in buying supply), with the factor loading of 0.874, and mean of score about 3.91. It explained the performance in buying supply was the main indicator on variable of performance of supply and distribution of production tools in which the implementation has been well assessed so that it should be maintained.

Table 7. Profile of variables on performance of processing (x2)

No.	Indicator	Factor loading	Mean of score
1	x21	0.833	3.73
2	x22	0.577	4.09
3	x23	0.881	4.55
4	x24	0.124	4.09

Source: processed data, 2019

Table 7, showed that the highest factor loading of variable x2 (performance of processing) was indicator x23 (performance in packaging), *i.e.* 0.881, with the average score of 4.55. Such condition showed that the main indicator on performance of processing was the performance in packaging which was considered as the best by most of respondents, so that it must be maintained.

Table 8. Profile of variables on performance of sales (x3)

No.	Indicator	Factor loading	Mean of score
1	x31	0.967	3.91
2	x32	0.753	4.36
3	x33	0.967	3.91

Source: processed data, 2019

Table 8, revealed that the main factor loading of variable x3 (performance of sales) was indicator x31 (performance in establishing price according to quality of Sumbawa forest honey) and x33 (performance in determining contract of sale cooperation), with the value of 0.967 and average score about 3.91. However, this mean was lower than that of x32 (performance in product efficiency) around 4.36. It meant that the implementation of performance in establishing price according to quality of Sumbawa forest honey and performance in contract of sale cooperation, was not good yet by most of respondents, so that it should be improved.

Table 9. Profile of variables on performance of supporting institution (x4)

No.	Indicator	Factor loading	Mean of score
1	X41	0.856	4.45
2	X42	0.381	3.91
3	X43	0.898	4.36
4	X44	0.886	4.36

Source: processed data, 2019

Table 9, showed that the highest factor loading of variable x4 (performance of supporting institution) was indicator x43 (performance of research institution) with the value of 0.898 and 4.36 in average. Indicator x41 (performance of farmer's group) had higher average score, namely 4.45. It indicated that performance of research institution was the main indicator on performance of supporting institution, however its implementation was not maximum, so that it should be increased.

Table 10. Profile of variables on performance of supply chain (y)

No.	Indicator	Factor loading	Mean of score
1	Y1	0.922	3.45
2	Y2	0.922	3.45
3	Y3	0.798	3.73
4	Y4	0.569	3.91

Source: processed data, 2019.

Table 10, showed that the highest factor loading variable y (performance of supply chain) was indicator y1 (yield quantity) and y2 (yield quality), namely 0.922, with the average score of 3.45. That value was lower than y3 (time accuracy of performance yield) about 3.73, and y4 (capability of cooperation) around 3.91. It showed that

quantity and quality of yield were the main indicator of performance on supply chain, however its implementation was not good yet by most of respondents, so that it should be improved.

### 3.4. Result of data analysis using Partial Least Square (PLS)

Result of WarpPLS analysis in graph was presented in Figure 3.

Figure 3. The direct effect of performance supply chain management for Sumbawa forest honey

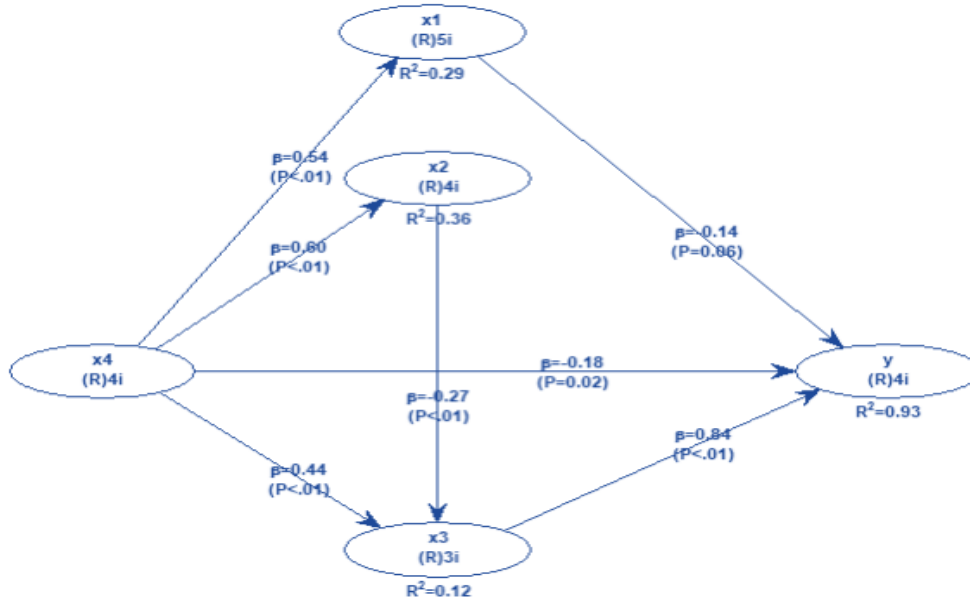


Figure 3, showed the model with path coefficient of direct effect. It indicated the direct and indirect effect among variables  $x_1$ ,  $x_2$ ,  $x_3$ ,  $x_4$ , and  $y$ . The direct effect of path coefficient occurred on variable  $x_4$  against variables  $x_1$ ,  $x_2$ ,  $x_3$ , and  $y$ . Such impact was also found on variable  $x_1$  against variable  $y$  and on variable  $x_3$  upon variable  $y$ . Path coefficient occurred indirectly on variable  $x_2$  against variable  $y$ , in which variable  $x_2$  should be through variable  $x_3$ . The results of indirect effect on path coefficient were presented in Table 11. Indirect impact of path coefficient occurred through two and three segments which were respectively presented in Table 12 and Table 13.

Table 11. Construct model of direct effect

No.	Relationship among variables (describing variable $\longrightarrow$ responding variable)	Path coefficient	p-value
1	$x_4 \longrightarrow x_1$	0.54***	$P < 0.01$
2	$x_4 \longrightarrow x_2$	0.60***	$P < 0.01$
3	$x_4 \longrightarrow x_3$	0.44***	$P < 0.01$
4	$x_1 \longrightarrow Y$	-0.14*	$P = 0.06$
5	$x_2 \longrightarrow x_3$	-0.27***	$P < 0.01$
6	$x_3 \longrightarrow Y$	0.84***	$P < 0.01$
7	$x_4 \longrightarrow Y$	-0.18**	$P = 0.02$

Note: \*\*\* = Significant on 1%; \*\* = Significant on 5%; \* = Significant on 10%

Source: processed data, 2019

The significant relationship between performance of supporting institution ( $x_4$ ) and performance of supply and distribution of production tools ( $x_1$ ) was illustrated in Figure 3 and Table 11. Positive coefficient revealed that the increment on performance of supporting institution about 1% would increase the performance of supply and distribution of production tools around 0.54. The significant correlation also occurred on performance of supporting institution ( $x_4$ ) with performance of processing ( $x_2$ ). Positive coefficient indicated that the improvement on performance of supporting institution around 1% would raise the performance of processing about 0.60. Similar relationship was also found on performance of supporting institution ( $x_4$ ) with performance of marketing ( $x_3$ ). Positive coefficient showed that the increase on performance of supporting institution about 1% would improve the performance of marketing around 0.44.



The significant relationship occurred on performance of supply and distribution of product tools (x1) against performance of supply chain (y), but with negative coefficient. It revealed that the increment on performance of processing about 1%, would decrease the performance of supply chain around 0.14. Such decline might be affected by the honey hunters selling the collected honey directly to consumers. This condition happened due to they needed fast funding or they got more profit if they sold it directly compared to collecting or selling it to JMHS.

The significant relation was also found on performance of processing (x2) against performance of sales (x3), however it was notified with negative path coefficient. It meant that when the performance of processing improved around 1%, the performance of marketing reduced about 0.27. The significant correlation occurred on performance of sales (x3) against performance of supply chain (y). Its positive path coefficient showed that the improvement on performance of sales about 1% would increase the performance of supply chain around 0.84. The significant relationship happened between performance of supporting institution and performance of supply chain (y), but with negative path coefficient. It exhibited that the escalation on performance of supporting institution around 1% would decrease the performance of supply chain about 0.18.

Table 12. Structural model of indirect effect of path coefficient from two segments

No.	Relationship among variables	Path coefficient	p-value
1	x4 → x2 → x3	-0.16*	P=0.07
2	x2 → x3 → y	-0.23***	P<0.01
3	x4 → x1/x3 → y	0.29**	P=0.04

Source: processed data

Four indirect path coefficients through two segments were presented in Table 12. The first one was the significant relationship of variable x4 on variable x3 through variable x2, with negative path coefficient. It meant the enhancement on performance of supporting institution about 1% would decline the performance of sales through performance of processing around 0.16.

The second path coefficient was the significant relationship between variable x2 and variable y through variable x3, but it was indicated with negative value. It revealed that there was the improvement of processing performance about 1%, would decrease the performance of supply chain through performance of sales around 0.23.

The next path coefficient was the significant correlation between variable x4 and variable y through variables x1 or x3, with the positive value. It indicated that there was the increment on performance of supporting institution as much as 1% would also improve the performance of supply chain through performances of supply institution and distribution of production tools or performance of sales about 0.29.

Table 13. Structural model of indirect effect of path coefficient from three segments

No.	Relationship among variables	Path coefficient	p-value
1	x4 → x2 → x3 → y	1*	P=0.006

Source: processed data

Table 13, showed the indirect significant relationship (three segments) between variable x4 and variable y through variables x2 and x3 with positive value. It expressed the improvement on performance of supporting institution around 1% which would increase the performance of supply chain through performances of processing, and performance of sales about 1.

## Conclusion

The performance of supply chain management for Sumbawa forest honey is directly influenced by performance of supply and distribution of product tools, performance of sales, and performance of supporting institutions.

## Acknowledgments

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# A Pareto Inefficient Path to Steady State in Recession

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## Abstract:

In this paper, the focus is on the concept of Nash equilibrium of a Pareto inefficient path (NEPIP) to examine the nature of the transition path to steady state after a shock that generates a severe recession. Risk-averse and non-cooperative households strategically and rationally choose a NEPIP if a shock that widely shifts the steady state downwards occurs. Because NEPIPs are not Pareto efficient, an infinite number of transition paths can be NEPIPs, but a unique NEPIP is eventually selected from among many possible NEPIPs by households through a tug of war between their preference to avoid a worst-case scenario and the expected utility.

**Keywords:** great depression; great recession; Pareto inefficiency; recession; transition path.

**JEL Classification:** D10; E21; E32.

## Introduction

Severe recessions like the Great Recession and the Great Depression persist for several years or more (Temin 1989, Martin *et al.* 2015, Hall 2016, Fernald *et al.* 2017), probably because it takes time to reach the posterior steady state after a shock that changed the steady state and generated the severe recession. Although the cause of severe recessions has long been studied from various points of view (Temin 1989, Hall 2011, Eggertsson and Krugman 2012, Mian and Sufi 2012, Christiano *et al.* 2015, Martin *et al.* 2015, Guerrieri and Lorenzoni 2017), no consensus about the cause has yet been reached. Because the cause remains unresolved, discussions about severe recessions have generally focused only on the cause, whereas the nature of the transition path to the posterior steady state during a severe recession has hardly been studied. Because the nature of the transition path will differ greatly, depending on the cause, researchers may have thought it would be fruitless to study the nature of the transition path in detail before knowing the cause.

Harashima (2016) showed a cause of the Great Recession that was based on the concept of a “Nash equilibrium of a Pareto inefficient path” (NEPIP). This concept is also shown in other papers by Harashima (2004, 2009, 2017, 2018a) and enables us to explain a mechanism for why a Pareto inefficient path is rationally chosen by households. If such a Pareto inefficient path is rationally chosen, phenomena like the Great Recession and Great Depression can be generated. An important feature of NEPIP is that it does not require a sudden huge technological regression or persisting rigidities in price adjustment processes to explain the generation of severe recessions.

In this paper, the nature of the transition path is examined on the basis of NEPIP. Risk-averse and non-cooperative households strategically and rationally choose a NEPIP if a shock that widely shifts the steady state downwards occurs. However, because NEPIP is not Pareto efficient - that is, because the constraint that Pareto efficiency should be kept does not exist - an infinite number of transition paths can be NEPIPs. The main purpose of this paper is to answer the question: How do households select a NEPIP from among many possible NEPIPs?

Households choose a NEPIP instead of the Pareto efficient saddle path strategically and rationally, by considering various possible options. A reason for not choosing the Pareto efficient saddle path in the first place is that a household dislikes, fears and avoids a worst-case scenario (hereafter, called “worst-case aversion”), and the selection of a NEPIP from among many possible NEPIPs will be also made considering this same household preference. In this paper, I show that households that possess worst-case aversion eventually select a unique NEPIP by calculating optimality on the basis of (1) the expected utility from consumption and (2) the expected probability that the foremost household (the household that first makes a decision) will be followed by all the other households.

As Harashima (2018b, 2019) showed, the NEPIP phenomenon can be equivalently explained on the basis of the concept of the MDC (maximum degree of comfortability)-based procedure. However, in this paper, I examine the nature of NEPIP on the basis of the model under the RTP (rate of time preference)-based procedure shown by Harashima (2004, 2009, 2017, 2018a).

## 1. Nash equilibrium of a Pareto inefficient path (NEPIP)

The mechanism and nature of NEPIP shown by Harashima (2004, 2009, 2017, 2018a) are briefly explained in this section.

### 1.1 The model

Households are assumed to be non-cooperative, risk averse, and infinitely living. They are also assumed to be identical in the sense that their preferences, labor incomes, and initial financial assets are identical. In addition, there is assumed to be a sufficiently large number of them. Each household maximizes its expected utility:

$$E \int_0^{\infty} u(c_t) \exp(-\theta t) dt \quad (1)$$

subject to:

$$\frac{dk_t}{dt} = f'(A, k_t) - c_t \quad (2)$$

where:  $c_t$ ,  $k_t$ , and  $y_t$  are consumption, capital, and production per capita in period  $t$ , respectively;  $A$  is technology;  $\theta$  ( $> 0$ ) is the rate of time preference (RTP);  $u$  is the utility function;  $y_t = f(A, k_t)$  is the production function; and  $E$  is the expectation operator.

Suppose that there is a shock that makes the RTP of a household shift upward (*i.e.*, increase) in period  $t = 0$ . After the shock, the steady state is changed from the prior (original) one to the posterior one. There are two options for each household with regard to consumption just after the shock. The first is a jump option  $J$ , in which a household's consumption jumps upwards and then proceeds on the posterior Pareto efficient saddle path to the posterior steady state. The second is a non-jump option  $NJ$ , in which a household's consumption does not jump but instead gradually decreases from the prior steady state to the posterior steady state. This transition path is not Pareto efficient. The household that chose the  $NJ$  option reaches the posterior steady state in period  $s$  ( $\geq 0$ ). The difference in consumption between the two options in period  $t$  is  $b_t$  ( $\geq 0$ ). The existence of  $b_t$  indicates that unutilized resources and excess capital exist, and they have to be somehow eliminated.

The probability that households choose option  $NJ$  will not necessarily be low because option  $J$  requires a discontinuous large and sudden increase in consumption, but risk-averse households intrinsically dislike this type of discontinuous change in consumption and want to smooth the stream of consumption. The expected utility of a household after the shock depends on whether the household chooses option  $J$  or  $NJ$ . Let  $Jalone$  indicate that a household chooses the  $J$  option but other households choose the  $NJ$  option,  $NJalone$  indicate that the household chooses the  $NJ$  option but other households choose the  $J$  option,  $Jtogether$  indicate that all households choose the  $J$  option, and  $NJtogether$  indicate that all households choose the  $NJ$  option. Let  $p$  ( $0 \leq p \leq 1$ ) be the subjective probability of a household that the other households choose the  $J$  option. With  $p$ , the expected utility of the household when it chooses option  $J$  is:

$$E(J) = pE(Jtogether) + (1 - p)E(Jalone) \quad (3)$$

and when it chooses option  $NJ$  is:

$$E(NJ) = pE(NJalone) + (1 - p)E(NJtogether) \quad (4)$$

where:  $E(Jalone)$ ,  $E(NJalone)$ ,  $E(Jtogether)$ , and  $E(NJtogether)$  are the expected utilities of the household when choosing  $Jalone$ ,  $NJalone$ ,  $Jtogether$ , and  $NJtogether$ , respectively.

A household determines whether to choose option  $J$  or  $NJ$  by strategically considering other households' choices.

### 1.2 The existence of Nash equilibrium of a Pareto inefficient path (NEPIP)

Harashima (2009, 2018a) proved that, under reasonable conditions, there is a  $p^*$  ( $0 \leq p^* \leq 1$ ) such that if  $p = p^*$ ,  $E(J) - E(NJ) = 0$ , and if  $p < p^*$ ,  $E(J) - E(NJ) < 0$ . That is, it is possible that a Pareto inefficient path (*i.e.*, a NEPIP) can be rationally chosen by households.

Suppose that there are  $H$  ( $\in N$ ) identical households in the economy and  $H$  is sufficiently large.

Households' strategic choices between options  $J$  and  $NJ$  are well described by a  $H$ -dimensional symmetric mixed strategy game. Let  $q_\eta$  ( $0 \leq q_\eta \leq 1$ ) be the probability that a household  $\eta$  ( $\in N$ ) chooses option  $J$ . Harashima (2009, 2018a) showed that strategy profiles:

$$(q_1, q_2, \dots, q_H) = \{(1, 1, \dots, 1), (p^*, p^*, \dots, p^*), (0, 0, \dots, 0)\} \quad (5)$$

are Nash equilibria of this game.

### 1.3. The preference of worst-case aversion

As shown by Harashima (2009, 2018a), refinements of the Nash equilibrium are required to determine which Nash equilibrium,  $NJtogether$  ( $0, 0, \dots, 0$ ) or  $Jtogether$  ( $1, 1, \dots, 1$ ), is dominant, and these refinements necessitate additional criteria. If households are worst-case averse in the sense that they prefer to avoid options that include the worst-case scenario when its probability is not known, they suppose a very low  $p$  and select the  $NJtogether$  ( $0, 0, \dots, 0$ ) equilibrium (i.e., a NEPIP), because  $Jtogether$  is the best choice in the sense of the amount of payoff, followed by  $NJalone$  and  $NJtogether$ , whereas  $Jalone$  is the worst. The outcomes of choosing option  $J$  are more dispersed than those of choosing option  $NJ$ . If households are worst-case averse in the above-mentioned sense, a household will prefer option  $NJ$  that does not include the worst-case scenario  $Jalone$ , because it fears the worst-case scenario that, after the shock, it alone will substantially increase consumption while the other households will substantially decrease consumption. This behavior is rational because it is consistent with the household's preference.

### 1.4. Nash equilibrium of a Pareto inefficient path and severe (NEPIP) recessions

Because NEPIP is Pareto inefficient and excess capital and  $b_t$  exist, unused resources are successively generated and eliminated—that is, a recession is generated. In this situation, as Harashima (2012) showed, the unemployment rate rises by frictions in the job search and matching process. Note that Harashima (2014b), also showed the generation mechanism of the shock on RTP. The main underlying factor that generates this shock is that households need to generate an expected RTP under sustainable heterogeneity, as shown by Harashima (2014a, 2014b).

## 2. Selection of a Nash equilibrium of a Pareto inefficient path (NEPIP)

### 2.1. Possible NEPIPs

Because NEPIPs are Pareto inefficient, an infinite number of possible ones can exist. On the other hand, it is highly likely that a NEPIP will not be a complex winding path but rather a simple monotonously decreasing path from the prior steady state to the posterior one, because risk-averse households dislike discontinuous change in consumption and prefer to smooth it.

Let  $\lambda$  be the value that determines the shape of a simple monotonously decreasing path from the prior steady state to the path of the posterior one, such that if  $\lambda > 0$ , consumption declines to greater extent in the early periods and then gradually approaches the level at the posterior steady state; if  $\lambda = 0$ , it declines in a straight line to posterior steady state consumption; and if  $\lambda < 0$ , it declines a smaller amount in the early periods and more as time passes. Figure 1 shows the shapes of NEPIPs for a positive, zero, and negative  $\lambda$ , as well as the likely shape of the Pareto efficient saddle path.

### 2.2 Features of Nash equilibrium of a Pareto inefficient path

#### 2.2.1 Expected utility

Figure 1 indicates that, as the value of  $\lambda$  increases, consumption decreases in any period before  $s$  and therefore the expected utility decreases. Hence, as  $\lambda$  increases, households will be more hesitant to choose a NEPIP. Because all identical households equally become more hesitant and they all are aware of this tendency, they will equally suppose a higher  $p$  if  $\lambda$  increases from the point of view of expected utility.

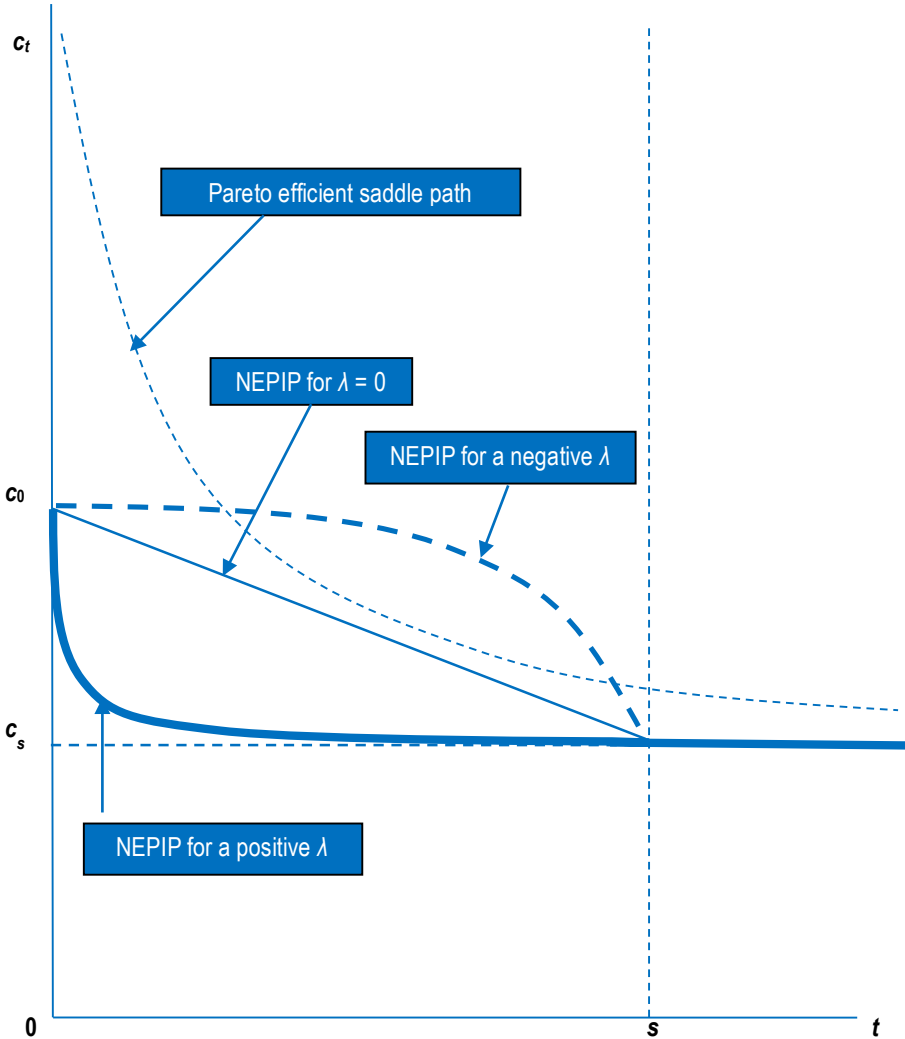
#### 2.2.2 Worst-case aversion

Since all households are identical and possess the preference of worst-case aversion, as discussed in Section 2.3, all households will equally suppose that they all prefer option  $NJ$  that does not include the worst-case scenario  $Jalone$ ; therefore, all of them will suppose a low  $p$  and select the  $NJtogether$  ( $0, 0, \dots, 0$ ) equilibrium, which is a NEPIP.

As  $\lambda$  increases, the NEPIP deviates more from the Pareto efficient saddle path (option  $J$ ), and the worst-

case scenario *Jalone* becomes even worse. Hence, as  $\lambda$  increases, households will have a greater preference for option *NJ* that does not include the worst-case scenario *Jalone*. Therefore, as  $\lambda$  increases, households will equally suppose a lower  $\rho$  from the point of view of worst-case aversion.

Figure 1. Nash equilibrium of a Pareto inefficient paths



2.2.3 The foremost household and followers

Even though all households are identical, as assumed in Section 2.1, they behave strategically by considering and expecting the other households’ possible actions and outcomes. Therefore, the choice of transition path after the shock may not necessarily be made simultaneously by all households. A household may wait to make its decision until observing other households’ decisions, where a decision here means choosing of a value of  $\lambda$ . However, at the same time, households cannot postpone decisions for a long period - they need to make a decision relatively soon after the shock. While each household is considering the others’ possible actions, a very small exogenous factor that is unrelated to preferences and heterogeneous to households will push one of the households forward. That is, a household (possibly even by accident) makes a decision (*i.e.*, chooses a value of  $\lambda$ ) and exhibits its decision to other households before any other household does. I call this household the “foremost household.”

All of the other households will make decisions by considering and evaluating the foremost household’s decision. I call these households “followers.” A follower will choose the same value of  $\lambda$  as that of the foremost household if it expects that many of the other followers will also make the same choice. From Section 2.2.1, we know that, from the point of view of expected utility, as the value of  $\lambda$  that the foremost household chooses increases, the probability that all followers will choose the same value decreases.<sup>1</sup> On the other hand, from Section

<sup>1</sup> Under the MDC-based procedure shown by Harashima (2018b, 2019), as the value of  $\lambda$  chosen by the foremost household

2.2.2, we know that, from the point of view of the worst-case aversion, as the foremost household's value of  $\lambda$  increases, the probability that all followers will choose the same value of  $\lambda$  as the foremost household will also increase. That is, expected utility and worst-case aversion act in opposite directions. Whether followers choose the same value as that of the foremost household therefore depends on the relative difference in the strengths of these two opposing forces.

#### 2.2.4 The expected probability of following the NJ

Taking the argument in Section 2.2.1 into consideration, the expected probability that all followers will make the same choice as that of the foremost household from the point of view of the expected utility can be most simply described by:

$$\Pi_U = \exp(-\mu\tilde{\lambda}) \quad (6)$$

where:  $\tilde{\lambda}$  is the  $\lambda$  that the foremost household chose, and  $\mu (> 0)$  is a constant.

Equation (1) indicates that, as the value of  $\tilde{\lambda}$  increases,  $\Pi_U$  decreases.

On the other hand, taking the argument in Section 2.2.2 into consideration, the expected probability that all followers will make the same choice as that of the foremost household from the point of view of worst-case aversion can be most simply described by:

$$\Pi_R = 1 - \exp(-\nu\tilde{\lambda}) \quad (7)$$

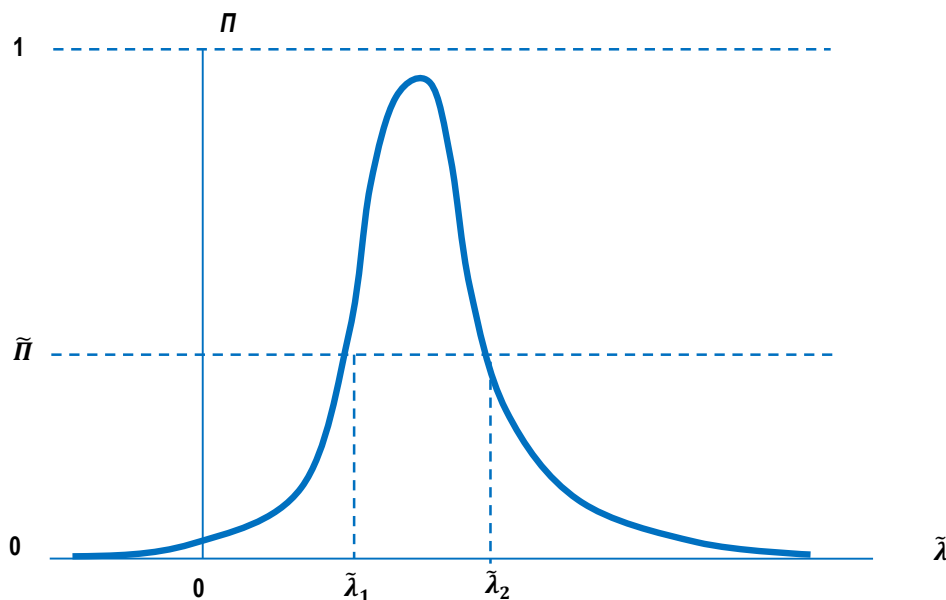
where:  $\nu (> 0)$  is a constant.

Equation (7) indicates that, as the value of  $\tilde{\lambda}$  increases,  $\Pi_R$  decreases. By equations (6) and (7), therefore, the combined expected probability that all followers will make the same choice as that of the foremost household from both points of view ( $\Pi$ ) is:

$$\Pi = \Pi_U \Pi_R = \exp(-\mu\tilde{\lambda}) - \exp[-(\mu + \nu)\tilde{\lambda}] \quad (8)$$

$\Pi$  indicates the initial expected probability that all other households make the same choice as the foremost household (Figure 2).

Figure 2. The initial expected probability that all followers will choose the same  $\lambda$  as the foremost household



The term “initial” is added because followers make their final decisions after considering not only equation (8) but also other related factors, as will be discussed below.

A following household initially considers whether it should follow the foremost household on the basis of the

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increases, the probability that all followers will choose the same value of  $\lambda$  decreases because of the higher level of discomfort caused by the destruction of resources, not because of lower expected utilities.

initial expected probability (*i.e.*, equation 8). There will be a unique value of  $\Pi$ ,  $\tilde{\Pi}$ , such that, if  $\Pi > \tilde{\Pi}$ , a follower always chooses the same value of  $\lambda$  as the foremost household ( $\tilde{\lambda}$ ). In Figure 2, therefore, if  $\tilde{\lambda}$  is located between  $\tilde{\lambda}_1$  and  $\tilde{\lambda}_2$ , a follower will always make the same choice as the foremost household. An important point is that the decisions of all followers eventually become identical, because all households are identical in the sense that they have identical preferences although they behave strategically, non-cooperatively, and independently. Hence, the consequence after the foremost household chooses  $\tilde{\lambda}$  is either that all followers choose it or no follower does. Hence, the “eventual” expected probability that all followers make the same choice as the foremost household is:

$$\Pi = 1 \quad \text{if } \tilde{\lambda}_1 \leq \tilde{\lambda} \leq \tilde{\lambda}_2 \quad \quad \Pi = 0 \quad \text{if } \tilde{\lambda} < \tilde{\lambda}_1 \text{ or } \tilde{\lambda}_2 < \tilde{\lambda} \quad (9)$$

If  $\tilde{\lambda}_1 \leq \tilde{\lambda} \leq \tilde{\lambda}_2$ , therefore, the NEPIP that the foremost household chose is selected as the Nash equilibrium in an economy.

### 2.3 Determination of a Nash equilibrium of a Pareto inefficient path

Because all households are identical, they all generate the same eventual expected probability (equation [9]). Hence, any foremost household will choose  $\tilde{\lambda}$ , giving sufficient consideration to equation (4). Because no household will follow the foremost household unless  $\tilde{\lambda}_1 \leq \tilde{\lambda} \leq \tilde{\lambda}_2$ , any  $\tilde{\lambda}$  outside  $\tilde{\lambda}_1 \leq \tilde{\lambda} \leq \tilde{\lambda}_2$  will be harmful for any foremost household. Hence, any foremost household will choose only a  $\tilde{\lambda}$  between  $\tilde{\lambda}_1$  and  $\tilde{\lambda}_2$ .

In addition, among the values of  $\tilde{\lambda}$  located between  $\tilde{\lambda}_1$  and  $\tilde{\lambda}_2$ , the NEPIP with  $\tilde{\lambda}_1$  gives the highest expected utility to the foremost household. Because any foremost household anticipates these consequences, it will generally choose  $\tilde{\lambda}_1$  as  $\tilde{\lambda}$ . As a result, the NEPIP with  $\tilde{\lambda}_1$  will be generally chosen as the NEPIP in an economy.

### 2.4 Simultaneous determination of the transition period

In the previous sections, the transition period  $s$  is given exogenously, but it may be determined endogenously and simultaneously with  $\tilde{\lambda}$ . It seems likely that households want to arrive at the posterior steady state as soon as possible. However, as  $s$  becomes shorter,  $\mu$  in equation (6) will increase because the expected utility decreases as  $s$  decreases for any given value of  $\lambda$ . In other words, if the value of  $s$  is sufficiently small, there will be no value of  $\tilde{\lambda}$  that makes  $\Pi > \tilde{\Pi}$  because of the corresponding larger value of  $\mu$ . Therefore, there will be the critical value of  $s$ ,  $\tilde{s}$ , such that if  $\tilde{s} \leq s$ , then  $\Pi > \tilde{\Pi}$  for at least one value of  $\tilde{\lambda}$ . That is, when  $s = \tilde{s}$ , the curve of the initial expected probability that all followers will follow the foremost household comes in contact with the line of  $\tilde{\Pi}$ , as shown in Figure 3.

Because all households are identical, all households know the value of  $\tilde{s}$ . In addition, because it seems likely that households want to arrive at the posterior steady state as soon as possible, any foremost household will choose  $\tilde{s}$  as  $s$ . As a result, the NEPIP with  $\tilde{s}$  and  $\tilde{\lambda}_1$  will be generally chosen as the NEPIP in an economy.

### 2.5 Nature of $\tilde{s}$

By equation (8), the maximal of  $\Pi$  is obtained at:

$$\frac{\partial \Pi}{\partial \tilde{\lambda}} = \frac{\partial \exp(-\mu \tilde{\lambda})}{\partial \tilde{\lambda}} - \frac{\partial \exp[-(\mu + \nu) \tilde{\lambda}]}{\partial \tilde{\lambda}} = 0 \quad (10)$$

and thereby at:

$$\tilde{\lambda} = -\frac{\ln\left(\frac{\mu}{\mu + \nu}\right)}{\nu} \quad (11)$$

Hence, if  $\frac{\partial \Pi}{\partial \tilde{\lambda}} = 0$  at  $\tilde{\lambda}_1$ , then

$$\tilde{\lambda}_1 = -\frac{\ln\left(\frac{\mu}{\mu + \nu}\right)}{\nu} \quad (12)$$

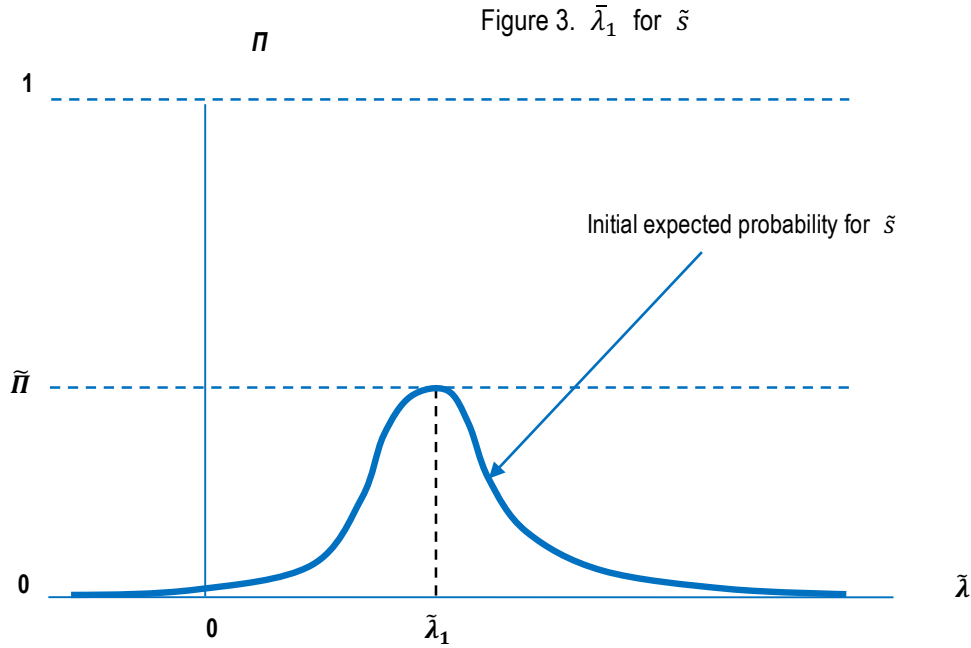
If the curve of the initial expected probability comes in contact with the line of  $\tilde{\Pi}$  at  $\tilde{\lambda}_1$  as shown in Figure 3, then by equation (8),

$$\tilde{\Pi} = \exp(-\mu \tilde{\lambda}_1) - \exp[-(\mu + \nu) \tilde{\lambda}_1] \quad (13)$$

and by equations (12) and (13),



$$\tilde{\Pi} = \left(\frac{\mu}{\mu+\nu}\right)^{\frac{\mu}{\nu}} - \left(\frac{\mu}{\mu+\nu}\right)^{\frac{\mu+\nu}{\nu}} \quad (14)$$



Here, as  $s$  decreases, the value of  $\mu$  in equation (6) increases because, as  $s$  decreases, the expected probability that all followers will make the same choice as that of the foremost household from the point of view of the expected utility ( $\Pi_U$ ) will decrease for any given value of  $\tilde{\lambda}$ . Hence,  $\mu$  is a function of  $s$  such that:

$$\mu = \hat{\mu}(s) \quad (15)$$

and

$$\frac{d\mu}{ds} < 0. \quad (16)$$

By equations (14) and (15),  $\tilde{s}$  should satisfy:

$$\left[\frac{\hat{\mu}(\tilde{s})}{\hat{\mu}(\tilde{s})+\nu}\right]^{\frac{\hat{\mu}(\tilde{s})}{\nu}} - \left[\frac{\hat{\mu}(\tilde{s})}{\hat{\mu}(\tilde{s})+\nu}\right]^{\frac{\hat{\mu}(\tilde{s})+\nu}{\nu}} = \tilde{\Pi}. \quad (17)$$

If  $\tilde{s}$  is too small,  $\mu = \hat{\mu}(s)$  becomes too large by inequality (16), and

$$\lim_{\mu \rightarrow \infty} \left\{ \left[\frac{\hat{\mu}(\tilde{s})}{\hat{\mu}(\tilde{s})+\nu}\right]^{\frac{\hat{\mu}(\tilde{s})}{\nu}} - \left[\frac{\hat{\mu}(\tilde{s})}{\hat{\mu}(\tilde{s})+\nu}\right]^{\frac{\hat{\mu}(\tilde{s})+\nu}{\nu}} \right\} = 0 < \tilde{\Pi}, \quad (18)$$

and if  $\tilde{s}$  is too large,  $\mu = \hat{\mu}(s)$  becomes too small by inequality (16), and

$$\lim_{\mu \rightarrow 0} \left\{ \left[\frac{\hat{\mu}(\tilde{s})}{\hat{\mu}(\tilde{s})+\nu}\right]^{\frac{\hat{\mu}(\tilde{s})}{\nu}} - \left[\frac{\hat{\mu}(\tilde{s})}{\hat{\mu}(\tilde{s})+\nu}\right]^{\frac{\hat{\mu}(\tilde{s})+\nu}{\nu}} \right\} = 0 < \tilde{\Pi}. \quad (19)$$

Therefore, if  $\tilde{s}$  is too small or too large, equation (10) is not satisfied. Hence,  $\tilde{s}$  must be neither too small nor too large. If this condition is satisfied,  $\mu = \hat{\mu}(\tilde{s})$  is also neither too small nor too large, and

$$\left[\frac{\hat{\mu}(\tilde{s})}{\hat{\mu}(\tilde{s})+\nu}\right]^{\frac{\hat{\mu}(\tilde{s})}{\nu}} - \left[\frac{\hat{\mu}(\tilde{s})}{\hat{\mu}(\tilde{s})+\nu}\right]^{\frac{\hat{\mu}(\tilde{s})+\nu}{\nu}} = \tilde{\Pi} > 0 \quad (20)$$

can hold unless  $\tilde{\Pi}$  is too large, because:

$$0 < \frac{\hat{\mu}(\tilde{s})}{\hat{\mu}(\tilde{s})+\nu} < 1 \quad (21)$$

and thereby:

$$\left[ \frac{\tilde{\mu}(\tilde{s})}{\tilde{\mu}(\tilde{s})+\nu} \right]^{\frac{\tilde{\mu}(\tilde{s})}{\nu}} > \left[ \frac{\tilde{\mu}(\tilde{s})}{\tilde{\mu}(\tilde{s})+\nu} \right]^{\frac{\tilde{\mu}(\tilde{s})+\nu}{\nu}} . \quad (22)$$

Therefore, unless  $\tilde{\Gamma}$  is too large, an  $\tilde{s}$  that is neither too small nor too large exists.

Harashima (2009, 2018a) indicated that  $s$  is not too small or too large for reasonable parameter values in the model shown in Section 2. Hence, generally,  $\tilde{\Gamma}$  will not be too large, and thereby an  $\tilde{s}$  that is not too small or too large will generally exist.

## 2.6 Government Intervention

Harashima (2017) showed that, if the government intervenes and utilizes  $b_t$  (e.g., by increasing government consumption), the transition period  $s$  is prolonged because the adjustment of excess capital is delayed. Each time the government intervenes, households will recalculate the values of  $\tilde{s}$  and  $\tilde{\lambda}_1$ . Because the elimination of the excess capital is delayed by the government's intervention,  $\tilde{s}$  will increase relative to the case when it does not intervene. Hence, if the government continues to intervene on a large scale for a long period, the eventual value of  $\tilde{s}$  will become very large and the transition period will be much longer.

## Conclusion

Severe recessions like the Great Recession and the Great Depression probably persist for several years or more because it takes time to reach the posterior steady state after a shock. Because the cause of severe recessions remains unknown, the nature of the transition path during severe recessions has received little if any study. In this paper, the nature of the transition path was examined on the basis of the NEPIP. Because a NEPIP is not Pareto efficient, (i.e., the constraint that Pareto efficiency should be kept does not exist), an infinite number of transition paths can be NEPIPs. Here, I examined the mechanism by which households select a NEPIP from among an infinite number of possible choices.

Households do not randomly select a NEPIP. Rather, they do so strategically and rationally considering the characteristics of each NEPIP. A reason for not choosing the Pareto efficient saddle path in the first place is that a household dislikes, fears and avoids the worst-case scenario, and the selection of a NEPIP from among many possible NEPIPs is also governed by this same preference. Households' preferences for expected utility and worst-case aversion act in opposite directions in their selection of a NEPIP. A NEPIP is selected through a tug of war between these two opposite forces, and eventually a unique NEPIP will be selected by households. In addition, the length of the transition period will be uniquely determined endogenously and simultaneously, depending on the shape of the NEPIP.

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## The Effect of Business Group Affiliation on Corporate Cash Holdings: Evidence from an Emerging Market Economy

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### Abstract:

This study examines the effect of business group affiliation on corporate cash holdings. Sample of this study consists of 101 companies listed not consecutively on the KOMPAS100 index between 2011 and 2015 in Indonesia. From the results, it is understood that business group affiliation has a significant and positive impact on corporate cash holdings while controlling cash flow, leverage, firm size, growth opportunity, and net working capital. This means that companies affiliated with a business group have larger cash holdings when compared to companies that are not affiliated with a business group.

**Keywords:** business group affiliation; cash holdings; emerging market economy.

**JEL Classification:** G30; G34.

### Introduction

The existence of business groups is common in the business world. Business groups are widely available in many countries and are one of the dominant forms of companies in most developing countries (Zhang and Huang 2013, Cai *et al.* 2016). In Indonesia, the business environment is dominated by a group of companies. Claessens, Djankov and Lang (2000) find that companies affiliated with business groups in Indonesia account for nearly 70%. Even in 2010, the total revenue of the top 10 groups of companies in Indonesia reached 9.27% of Indonesia gross domestic product (Sulistiowaty 2012).

During the periods of high economic growth, business groups can improve investment efficiency by sharing resources to replace the role of external capital markets that have not been running optimally in developing countries when compared to developed countries (Chang and Hong 2000, Mahakud and Dash 2013). The existence of an internal market is one of the advantages of business group affiliation, thus doing businesses in the form of business groups a major source of capital in emerging markets (Khanna and Yafeh 2005). Business groups can function as an internal capital market where capital can be allocated among affiliated companies, causing economic benefits, especially when external funding is scarce and uncertain. Affiliated and diversified companies in their business are superior to companies that are not affiliated with business groups, due to the internal capital market

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of a group of companies effectively resembling functions provided in financial markets in developed countries (Gupta and Mahakud 2018).

Business group affiliation can be interpreted as a company incorporated in a certain control hierarchy because its controlling shareholders have control of two or more other companies (He *et al.* 2013). Altomonte and Rungi (2013) argue that companies affiliated with business groups can be seen from the ownership of shares in the controlling shareholders with a number of shares of more than 50% in each company that is controlled, both directly and by cross-shareholding. Therefore, it can be concluded that the business group is a group of companies with a number of more than one, which has a certain control hierarchy structure because the controlling shareholders of the company dominate the ownership of shares with total ownership of more than 50%. Morck, Wolfenzon and Yeung (2005) state that the characteristics of ownership of business groups vary in different countries. For example, companies affiliated with business groups in India are mostly listed companies. In China, not only individuals or certain families own a group business, but also regional governments have it, which is usually called a state-owned enterprise (SOE). In Korea there is the term "chaebol" which is a company owned by several families. In Japan there is the term "keiretsu" which is characterized by several company owners often focusing on bank ownership. Claessens, Djankov and Lang (2000) reveal that families with a pyramid ownership structure control more than 50% of group companies in Indonesia. The form of business groups is usually found in developing countries with the reason as a way to reduce the financial crisis.

The purpose of this study is to analyze whether companies affiliated with business groups have an influence on corporate cash holdings. Orens and Reheul (2013) state that the corporate cash holdings have received extensive attention in the literature in recent years. Khan, Saqib and Ahmad (2016) argue that cash holdings are still considered insufficient to prove the company's motivation for holding excess cash, so research on the determinants of company cash holdings is needed. The authors of the present study have taken business group affiliation as a factor that affects cash holding because the topic is very relevant to conditions in emerging markets, especially in Indonesia, where business groups are the dominant form of company. Gupta and Mahakud (2018) and Tsai (2012) find that companies affiliated with business groups tend to have higher cash holdings than companies that are not affiliated with business groups. The results of the present study indicate that the presence of business groups has a positive effect on corporate cash holdings in Indonesia. This finding explains that companies affiliated with business groups have higher cash holdings than companies that are not affiliated with business groups.

## 1. Literature review and hypothesis

One of the firm's goals to hold cash is due to precautionary motives which aim to be able to deal with adverse shocks to future cash flows. Business groups can change the company's liquidity strategy by reducing uncertainty of future cash flows in several ways, for example, in business groups allowing the formation of internal capital markets, which can partly replace the role of external markets in meeting the financial needs of affiliated companies (Cai *et al.* 2016). The internal capital market allows information mitigation and contract enforcement issues from external financing, resulting in low asymmetry of information among affiliated companies (Locorotondo, Dewaelheyns and Van Hulle 2014). Business groups can collect funds from affiliated members and allocate them to the most profitable projects. As such, business groups can be seen as more efficient channels for allocating capital and managerial resources among affiliated companies. This function is especially true when external market conditions are underdeveloped.

In addition to providing internal capital markets, business groups can help affiliated companies obtain external financing. Business groups can increase the carrying capacity of debt for affiliates by connecting affiliates with each other. Group reputation allows affiliated companies to gain access to external financing (Chang and Hong 2000, Mahakud and Dash 2013). Besides guarantees among affiliates also increase the availability of external financing because the assets of one group member can be used as collateral for other affiliates. Overall, business group affiliation is expected to result in increased financial access and ability to generate more stable future cash flows, ultimately reducing the precautionary motive of affiliated companies to hold some cash (Gupta and Mahakud 2018).

However, the presence of majority shareholders in a business group can cause an entrenchment effect of large shareholding that arises due to agency problems between majority shareholders and minority shareholders (Ozkan and Ozkan 2004). This is because in companies affiliated with business groups there is a separation of cash flow rights and control rights that can cause the majority shareholders of the company to have strong control over the company and managers, one of which is to regulate the company's cash holding policy. So that at a certain level, the majority shareholders begin to have dominant control over the company and influence managers to make

decisions in order to achieve personal interests without considering the interests of minority shareholders, one of which is by holding large amounts of cash holdings, causing an imbalance between marginal costs and marginal benefits cash and do not share cash in the form of dividends to minority shareholders.

H1: Business group affiliation has a significant and positive effect on corporate cash holdings. Companies that are affiliated with business groups have a greater amount of cash holdings than companies that are not affiliated with business groups.

## 2. Methodology

Multiple regression analysis is used in this research. It employs panel data (the used observations consist of several companies over several years). Data obtained is processed, then quantitatively analyzed and further processed using the E-views 9. The dependent variable of this study is cash holdings which are calculated using the following formula: cash and equivalent divided by total assets.

Independent variable is business group affiliation. The business group variable is a dummy variable, and value of one if the company is owned or has another company and zero for otherwise. Control variables are cash flow, leverage, firm size, growth opportunity and net working capital. Cash flow is formulated as follows: operating cash flow divided by total assets. Leverage is formulated as follows: total liabilities divided by total assets. Firm size is formulated as follows: log natural of total assets. Growth opportunity is formulated as follows: (total assets period  $i$  minus total assets period  $i-1$ ) divided by total assets period  $i-1$ . Net working capital is formulated as follows: (current assets minus current liabilities) divided by total assets

This study uses a purposive sampling technique for obtaining the sample. The criteria used are as follows:

- Non-financial firms listed in KOMPAS100 index between 2011 and 2015 in Indonesia;
- State-owned enterprises excluded;
- The firms' issuance audited annual reports.

Table 1. Sample

Criteria	Firms
The number of companies listed in the KOMPAS100 index for a minimum of one year (semester I and II) between 2011 and 2015 in Indonesia	141
Financial firms	(20)
State-owned enterprises	(14)
Data incomplete	(6)
Sample	101

Based on the sampling criteria, this study uses unbalanced panel data. The observations of this study are 311. The sample consists of 101 firms.

Table 2. Observations distribution

Sector	Affiliated Firms	Unaffiliated Firms	Observations
Agriculture	23	12	35
Mining	28	22	50
Manufacture	59	22	81
Services	114	31	145
Total	224	87	311

Table 2 illustrates the distribution of observations in companies affiliated with business groups and those not affiliated with business groups. Total observations are 311. Companies that are affiliated with business groups have a total of 224 data observations, while companies that are not affiliated with business groups have a total of 87 data observations. Table 2 also shows that the service sector dominates companies affiliated with business groups at 51% with 114 observations. Furthermore, the manufacturing sector is 26% with 59 observations. The mining sector is 13% with 28 observations. The agricultural sector has the lowest percentage of 10% with 23 observations. The data collection method used in this study is the documentation. The authors have collected data that is already available on the Indonesia Stock Exchange and Saham OK sites. Data collected is secondary data.

## 3. Results

Table 3 shows that the standard deviation for cash holdings is 0.0973, and the mean value is 0.1074. Business group affiliation is proxied with a dummy of companies affiliated with a business group. The existence of companies affiliated with business groups has a mean value of 0.6595 and a standard deviation of 0.4972. Cash flow has a

mean value of 0.0836, while the standard deviation value is 0.1100. Leverage has a mean value of 0.4684, while the standard deviation value is 0.2054. Firm size is measured with total assets. The standard deviation of total assets is 29.90 trillion Indonesian Rupiahs (IDRs), and the mean value is 7.85 trillion IDRs. Growth opportunity has a mean value of 0.1258, while the standard deviation value is 0.1903. Net working capital has a mean value of 0.1702, while the standard deviation value of 0.2429.

Table 3. Descriptive statistics

Variables	Maximum	Minimum	Mean	Standard Dev.
Cash holdings	0.5141	0.0002	0.1074	0.0973
Dummy Group	1.0000	0.0000	0.6595	0.4972
Cash flow	0.5207	-0.4069	0.0836	0.1100
Leverage	0.9467	0.0006	0.4684	0.2054
Size (Billion IDRs)	245,435	118.034	17,853.925	29,905.693
Growth opportunity	0.9990	-0.7431	0.1258	0.1903
Net working capital	0.9561	-0.4211	0.1702	0.2429

Multicollinearity test is used to determine the high or low linear relationship between independent variables. In this study, the authors have employed the Pearson Correlation test. Table 4 shows that there are no independent variables that have high correlation coefficients or that exceed 0.90. It can be concluded that there are no high multicollinearity problems in the present research model.

Table 4. Correlation Matrix

Variables	Dummy group	Cash Flow	Leverage	Firm size	Growth opportunity	NWC
Dummy group	1	-	-	-	-	-
Cash flow	-0.0178	1	-	-	-	-
Leverage	-0.0351	-0.0647	1	-	-	-
Firm size	0.0024	0.0578	0.1946	1	-	-
Growth opportunity	0.0356	-0.0186	-0.0472	0.0698	1	-
NWC	-0.0118	-0.0883	-0.5384	-0.2158	-0.0331	1

Table 5 shows that business group affiliation has a significant and positive effect on cash holdings. This can be seen from the coefficient value of 0.0133 and the probability value of 0.0410. These results indicate that companies affiliated with business groups have greater cash holdings when compared to companies that are not affiliated with business groups. This result supports the studies of Gupta and Mahakud (2018) and Tsai (2012). The positive relationship between business group affiliation and cash holdings shows that the dominance of the entrenchment effect of large shareholders arises due to agency problems between majority shareholders and minority shareholders (Ozkan and Ozkan 2004). In companies affiliated with business groups, there is a separation of cash flow rights and control rights that can cause the majority shareholders of the company to have strong control over the company and managers, one of which is to set the company's cash holding policy. Besides, the characteristics of business groups in Indonesia that are dominantly controlled by family businesses (Claessens Djankov and Lang 2000), where shareholders often use control over the company to choose managers who have a special relationship with the majority shareholders. Due to the dominant control by the majority shareholders, the combination of managers and majority shareholders now has the same interests, which are not necessarily in line with the interests of minority shareholders. This encourages managers and majority shareholders to make decisions to achieve personal interests without considering the interests of minority shareholders, one of which is by holding large amounts of cash holdings, causing an imbalance between marginal cost and marginal benefit cash and not dividing cash in the form of dividends to minority shareholders.

Table 5. Regression result

Variables	Fixed effect model
	Unbalanced panel data
Intercept	1.2451 (0.0000) <sup>a</sup>
Dummy group	0.0133 (0.0410) <sup>b</sup>
Cash flow	0.1573 (0.0023) <sup>a</sup>
Leverage	0.0614

Variables	Fixed effect model
	Unbalanced panel data
	(0.2067)
Firm size (Ln total assets)	-0.0404 (0.0000) <sup>a</sup>
Growth opportunity	0.0352 (0.0877) <sup>c</sup>
Net working capital	0.0428 (0.2728)
Observations	311
R-Squared	0.8194
Adjusted R-Squared	0.7256
F-Stat	8.7347
Prob (F-Stat)	0.0000 <sup>a</sup>

Note: Significant level: a =1%, b =5%, c=10%.

Cash flow (control variable) has a significant positive effect on cash holdings at the 1% significance level. Table 5 shows the regression coefficient of 0.1573 with a probability value of 0.0023. This result supports the study of Ferreira and Vilela (2004). Leverage (control variable) does not have a significant effect on cash holding. This can be seen from the coefficient value of 0.0614 with a t-test probability of 0.2067. This result supports the studies of Ozkan and Ozkan (2004) and Ferreira and Vilela (2004). Firm size (control variable) has a significant negative effect on cash holdings at the significance level of 1%. Table 5 shows the coefficient value of -0.0404 with a probability value of 0.0000. This result supports the study of Gill and Shah (2012). Growth opportunity (control variable) has a significant positive effect on cash holdings at the significance level of 10%. Table 5 shows the coefficient value of 0.0352 with a probability value of 0.0877. This result supports the work of Ozkan and Ozkan (2004). Net working capital (control variable) does not have a significant effect on cash holding. This can be seen from the coefficient value of 0.0428 with a probability value of 0.2728. This result also supports the work Islam (2012).

## Conclusions

This study examines the effect of business group affiliation on corporate cash holdings listed in KOMPAS100 index between 2011 and 2015. The result shows that business group affiliation had a significant and positive effect on corporate cash holdings. Companies that are affiliated with business groups have greater cash holdings than companies that are not affiliated with business groups. This research is expected to assist firms in managing and optimizing their cash holdings in order to maintain the company's existence so that it can improve the welfare of agents and principals on an ongoing basis and meet the needs of company operations. It is expected that the company can maximize the roles and responsibilities of the majority of shareholders and managers in determining policies related to corporate cash holdings. Suggestion for future research is to conduct a robustness test, which uses cash and equivalent to net assets (net assets = total assets minus cash and equivalent cash) as a measurement for corporate cash holdings.

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## European Leveraged Buyout Exit Strategies: Market Timing versus Pseudo Market Timing

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### Abstract:

In this paper, the impact of Market Timing versus Pseudo Market Timing on the choice of exit from a Leveraged Buyout (LBO) is studied. Initial Public Offering (IPO) and acquisition waves and the exit choices of 3237 European Buyout-Backed over a period from 2004 through 2018 are also investigated. Initially, the main factors that influence the exit strategy of an LBO, namely the economic conditions and the stock market returns at the time of the exit are discussed. Thereafter, details of exit choices and the acquisition and IPO "waves" are studied. These different tests are carried out, first, on the global sample, and second, on several European countries (France, Germany and the United Kingdom). The obtained results partially support the Pseudo Market Timing assumptions and confirm both the application of Market Timing and the ability of funds investment to time the market successfully. Indeed, the results of the cross-sectional regression show that market returns in the two quarters preceding the exit are higher than the post-exit returns in the cases of IPOs and acquisitions. Nevertheless, post-IPO returns are negative while post-acquisition returns remain positive. Moreover, the study of exit choices using Probit regression shows that the increase in exit probability via an IPO is associated with the increase in market returns during the two quarters preceding the exit and the lower subsequent returns.

**Keywords:** market timing; pseudo market timing; LBO; IPO; acquisition.

**JEL Classification:** G14; G24; G32; G34.

### Introduction

Total and partial exit from a Leveraged Buyout (LBO) can take two forms: An Initial Public Offering (IPO) or an acquisition (Sales to strategic buyers, secondary LBO, tertiary LBO, etc.). There are several factors involved in choosing the exit strategy. In fact, IPOs and acquisitions have different impacts on access to capital, organizational structure and control. In addition, it should be emphasized that managers and investors are likely to have different goals that may cause disagreement over the preferred exit strategy. Given the multiplicity of factors, the analysis of an LBO investment project should incorporate the study of the investor exit at term. Although any investor cannot be certain about what conditions and with what counterparty he will be coming out. Then, the most reasonable scenarios should be considered and discussed.

In this research, the main factors that influence the choice of exit from an LBO, namely the economic and the stock markets conditions at the time of the exit, are discussed. To this aim, a distinction between the Market Timing and the Pseudo Market Timing (Ball, Chiu and Smith 2011, Butler, Grullon and Weston 2005, Schultz 2003) was required. Market Timing refers to a timing of the IPO market based on an underlying belief that issuers or underwriters can time an IPO to take advantage of the over-optimism of investors in the market reflected by a price overvaluation in the market (Ball, Chiu and Smith 2011, Huang, Uchida and Zha 2016, Lewis and Tan 2016). The Pseudo market timing has been defined by three non-opportunistic logics that can affect the choice of the exit

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strategy of an LBO, namely information asymmetry, Capital demand and the relative costs of IPOs and acquisitions. These justifications are not mutually exclusive, but are empirically indistinguishable.

In this paper, we studied the exit choice directly and we examined the "waves" of IPOs to evaluate the Market Timing hypothesis against the alternative hypothesis of Pseudo Market Timing. Our sample focuses exclusively on three markets: The United Kingdom, Germany and France, which, are both the most attractive markets of IPOs, and the most dynamic markets in terms of the number of LBO transactions in Europe, particularly the United Kingdom.

The main interest of our study is to give a new light on the interpretations of the statistical proof of Market Timing in the previous researches on the Timing of the IPOs and on the choice of exit of a Buyout investment. Indeed, it is the first study that examines the waves of exit strategies of LBOs, whether in the American or European literature, and which supports these results by a comparison between different European countries.

The remainder of the paper proceeds as follows. In the second section, we develop the hypotheses. In the third section, we briefly overview the methodology and data. In the fourth section, we present detailed findings from our data analysis. In the final section, we summarize our key conclusions.

## 1. Literature review

### 1.1. Pseudo market timing

The existence of IPO waves has been widely documented by Baschieri, Carosi, and Mengoli (2016), Güçbilmez (2015) Ibbotson and Jaffe (1975), Ritter (1984). This phenomenon has been attributed to the practice of pseudo market timing which has been explained by three non-opportunistic logics, presented by Ball, Chiu, and Smith (2011), which can affect the choice of the exit strategy of an LBO:

- information asymmetry (Lelet and Pyle 1977, Lowry 2003, Lowry and Schwert 2004): Companies choose an IPO when the overall level of activity of IPOs is high so that the adverse selection costs are mitigated;
- Capital demand (Lowry 2003, Poulsen and Stegemoller 2008): Companies use IPOs when the demand for total capital on the market is high;
- the relative costs of IPOs and acquisitions (Pagano, Panetta and Zingales 1998, Ritter 1987): IPOs are more likely to occur when large firms are involved and when market values of securities are high.

#### 1.1.1 Information asymmetry

The quality of newly listed companies can be adversely affected by the information asymmetry between investors and issuers about the true value of the company. Indeed, unlike selling shareholders, investors have access to very little information about the company that will go public. In addition, this information is selected by the selling shareholders who are asked to present it in order to make their company more attractive. This rather obvious premise has nonetheless revolutionized modern economic thinking since the 1970s.

According to Lelet and Pyle (1977), the information asymmetry can cause the phenomenon of adverse selection and moral hazard. They show that entrepreneurs can report the value of their businesses, by investing more of their wealth. Thus, unlisted companies do not face serious adverse selection costs. This adverse selection cost is a more serious barrier for youth and small firms that have little visibility (a modest analyst track and low institutional ownership) and concentration of ownership, therefore these firms will be more likely to do not enter the stock market to avoid the costs of adverse selection.

Investors are generally less well informed than issuers about the true value and quality of the newly listed company. Thus, the information asymmetry on the quality of the issuers causes an adverse selection and must be a factor influencing the decision of an IPO (Pagano, Panetta and Zingales 1998).

The adverse selection costs may also have an impact on the episodic activity of IPOs during periods when information asymmetry is less severe. Good and bad businesses are more likely to come together during these times. If the capital requirement is high relative to the value of the assets in place, then the probability of an IPO of a company is reduced (Yung, Çolak and Wang 2008) provide a formal model of the variation of information asymmetry in the IPO market. In their model, high- and low-quality firms separate when demand for capital is low and unite when demand is high.

Myers and Majluf 1984 explain the relation between information asymmetry and emission activity in their "winner's curse" model while showing that the emission activity may result from a variation in the intensity of the information asymmetry. In their model, potential issuers represent low quality companies with significant growth opportunities and good quality ones with poor growth opportunities. Because investors can not distinguish between high-and low-quality companies, they assume that all issuers are issuing medium quality companies. If the underestimation of the market is large enough, then it leads to a separation (the high-quality companies are unable

to justify the issue of shares). These companies are coming out of the IPO market, reducing the average quality of real issuers.

Information asymmetry can also improve during IPO waves, as more information about other companies that have recently been listed will be available on the stock market. As a result, issuers and underwriters can more easily agree on the price of an IPO, and known values on the latest IPOs can reduce information costs for investors. Lowry and Schwert (2004) incorporate this notion into their analysis of the price revision of IPOs in response to public information. Theories claiming that the clustering of IPOs is related to information asymmetry are advanced by Stoughton, Wong and Zechner (2001) who have shown that previous IPOs reveal information about market size, inducing others to issue and by (Maksimovic and Pichler 2001) who have shown that previous IPOs reveal information about the probability of success of a technology, inducing a gathering of sectoral specificities.

In accordance with the above, Poulsen and Stegemoller (2008) hypothesize that the IPO market is better suited to companies that are easily valued, while the acquisition market is better suited to transactions whose asymmetric information involves high selection costs. Based on this hypothesis, Ball, Chiu and Smith (2011) deduce that if information asymmetry is in part a phenomenon covering a sector or the whole market, then firms may prefer IPOs when IPO market conditions dampen investor concerns about adverse selection.

### *1.1.2 Capital demand*

The possibility of exploiting attractive public equity markets by high-growth companies with large current and future investments, as well as, companies that have limited access to other sources of funding due to high leverage or costs of high transaction, is one of the main reasons for IPOs. For example, firms that do not have large investments and firms that do not have future growth opportunities are more likely to not go public.

The previous analysis suggests that companies with financial constraints prefer to be listed to finance their investment opportunities since:

- visibility in capital markets may be a prerequisite to raising additional capital as suggested by (Pickens 1987);
- their public status allows them to take advantage of competition between investors and to negotiate private capital at better rates (Pagano and Roell 1996).

The capital demand hypothesis can be based on the fact that when firms expect stronger economic growth, they tend to seek more funding to provide investment capital. Consistent with this hypothesis, (Derrien and Kecskés 2009) report empirical evidence suggesting that 40% of the change in equity issuance can be explained by economic fundamentals.

Myers' (1984) hypothesis implies that low-cost sources of financing such as the bank's debt may become scarce when the overall demand for investment capital is high, thus leading to high interest rate. When capital is expensive, the waves of IPOs are likely to be driven by events that increase the aggregate capital demand. During these periods, the capital demand by the company is likely to increase and potential buyers can also face attractive offers of internally generated investment opportunities. (Lowry 2003, Poulsen and Stegemoller 2008) hypothesize that because of their capital needs, firms may prefer IPOs when aggregate capital demand is high. By extension, Ball, Chiu, and Smith (2011) argue that during these periods, potential buyers may be less interested in acquisitions because they face a multitude of internally generated investment opportunities.

### *1.1.3. Relative cost*

As proposed by Ritter (1987) and Brau, Francis, and Kohers (2003), IPOs are expensive and part of their cost is fixed. When market values are low, the fixed costs of IPOs can tip the balance in favor of exit through an acquisition. Conversely, the IPO activity is higher when market valuations are high. Although the relative cost reasoning is straightforward, it is not easy to distinguish it empirically from the effect of information asymmetry. Because high market values can reduce the relative cost of a public offering because of scale effects. They can also mitigate information asymmetry by allowing companies to raise more capital or issue smaller fractions of securities, so that the negative signal initially examined by Lelet and Pyle (1977) will be less severe.

## *1.2. Market timing*

Lowry (2003) examined the determinants of the change in the IPO activity and suggests that the level of investor optimism can explain these fluctuations which determine the periods of "Hot and Cold market". Indeed, if investors are very optimistic, then the markets will have a higher demand for equity, which makes it a good time to issue new shares. This reasoning was supported by Lee, Shleifer, and Thaler (1991), Lerner (1994), Loughran, Ritter, and Rydqvist (1994), Rajan and Servaes (1997), Pagano, Panetta, and Zingales (1998), Baker and Wurgler (2000), R.

Ritter and Welch (2002), Lowry (2003), Güçbilmez (2015). They use the assumption that even if issuers do not have private information about their companies, they may be able to see when the market is bullish. They can also predict the likelihood of a decline in market value or a decline in its returns. Thus, fluctuations in the intensity of the issuing activity can be affected by the efforts made by the issuers to exploit the excess of optimism on the market or at the sectoral level. In this case, they referred to Market Timing. The waves of IPOs can occur if issuers believe they can perceive times when investors are overly optimistic. The literature treats Market Timing as driven by market inefficiency. To manifest empirically as waves of IPOs, the excess of optimism must cover the entire market or an entire sector.

Several researchers generally infer a successful Market Timing based on:

- negative market returns after peaks of IPOs;
- negative statistical relationships between issuing activity and subsequent market returns;
- the decline in market returns from before to after exit.

None of these, by itself, is entirely satisfactory for distinguishing Market Timing practices from those of Pseudo Market Timing. If companies are more likely to emit after the peak of the market, pre-IPO returns will be above average and post-IPO returns will be lower due to a simple return to average. The decline would be a potential indication of Market Timing success only if post-IPO returns are below average. However, this would not be conclusive proof of the opportunist motive. Even if negative or very low post-IPO market returns refer to a successful Market Timing, this can not prove that issuers are timing an IPO to take advantage of the investor's excess optimism as reflected by price overvaluation (Huang, Uchida and Zha 2016, Lewis and Tan 2016). As long as decisions to go public are correlated with subsequent market or sector performance, statistically significant evidence of Market Timing's success must be unveiled, even if issuers do not seek to exploit investors. Statistical evidence does not support this causality, and the inference may be refuted by evidence that non-opportunistic exit options are also correlated with subsequent market returns. In addition, variable risk premiums over time may explain changes in returns as they may interpret negative regression between IPO activity and market performance.

Therefore, to test the successful Market Timing, (Ball, Chiu and Smith 2011) used four criteria. They defined a successful Market Timing if:

- post-IPO market returns are negative;
- post-IPO market returns are significantly lower than post-acquisition returns;
- the cross-sectional statistical relationship between IPO activity and post-IPO market returns is significantly negative;
- the relationship between IPO activity and post-IPO returns is significantly more negative than that between acquisition activity and post-acquisition returns.

The absence of any of these criteria refutes the Market Timing hypothesis. Comparisons with post-acquisition returns are appropriate because the Market Timing assumption does not apply to acquisitions. If issuers behave opportunistically, they should want to issue when market values are high. They should not want to exchange shares listed by the shares of a company acquired since the shares of the listed company are likely to be overvalued. In addition, if owners of unlisted companies can time the market, then acquirers may also do so, but acquirers do not want to trade the cash for equities when they believe there is an overvaluation of equities by the market.

Wadhwa and Reddy Syamala (2018) examined the Market Timing hypothesis vs the market conditions hypothesis in an emerging economy, India. They examined 3,958 IPOs for the 20-year period, *i.e.* 1991-2009. The authors used direct test to examine the impact of Market Timing and Pseudo Market Timing variables on the IPO activity. The direct tests are based on the positive relation of Market Timing variables and market conditions variables with IPO activity. They examined the long-run performance of IPOs by using, as indirect test, the calendar-time regression approach to test Market Timing against Pseudo Market Timing. Evidence of Market Timing using indirect test shows that there is a decline in the long-run stock performance of IPOs.

### 1.3. Initial public offering waves

Lowry (2003) examine why the volume of IPOs has fluctuated over the years and suggest that capital demand, the cost of adverse selection, and the level of investor optimism may explain these fluctuations. In this research, Lowry prove that there is a negative relationship between the volume of IPOs and market returns after the issue. (Ljungqvist, Neta and Singh 2006) support this result by providing a theoretical model for linking the "Hot Market" phenomenon to investor confidence.

Schultz (2003) proposes theoretically the Pseudo Market Timing assumptions to explain IPOs waves, arguing that after IPO transactions, it can be seen that share sales were concentrated around the maximum price, but this peak can not be observed before the IPO. This explains the long-term underperformance of firms following their IPOs. This underperformance is very likely to be observed ex post in an efficient market. The premise is that many companies emit equity when equity prices rise, even though they can not predict future returns. According to Pseudo Market Timing, the volume of IPOs is positively related to the indicators of economic growth. (Pástor and Veronesi 2005) develop an optimal Market Timing model in which the IPO volume fluctuates due to time variations of market conditions.

Baschieri, Carosi, and Mengoli (2016) study the relationship between the success of IPOs in a given region and the subsequent IPO volume in the same region using the regional average undervaluation and the excess demand for newly issued securities. They find that high local IPO performance is able to trigger a wave of local IPOs due to the attempt by unlisted companies to exploit favorable local market conditions.

Güçbilmez (2015) analyzes the IPO waves in China and Hong Kong and compares with the US IPO waves. He concludes that the "lead-lag" relationship between initial IPO returns and IPO volume in the US is absent in both Asian markets. Like the United States, the volume of Hong Kong IPOs is sensitive to changes in market conditions and is subject to seasonal variations. On the other hand, Chinese IPOs activity is much less sensitive to returns and past market volatility. Surprisingly, Hot Markets are still emerging in China, not because of market forces like the United States and Hong Kong, but because of the regulatory choices that condition the market.

Companies tend to go public during periods of low information asymmetry. Lowry and Schwert (2002) and Benveniste *et al.* (2003) shown that the availability of information is one of the main determinants of the "hot market" phenomenon. The idea is that the information generated by the valuation of a set of investors makes the valuation of companies easier and thus triggers more IPOs. This is explained by the contagion effect. Timing of introductions following market peaks can be explained as an attempt at Market Timing or a mitigation of information asymmetry or a decrease in relative cost.

Boeh and Dunbar (2014) examine the impact of the institutional characteristics of the stock market on IPO waves. Their results support the hypothesis that past decisions convey private information about the collective view of issuers on the state of the IPO market (beyond what is indicated by other macroeconomic indicators), which affects the level of investor optimism.

#### 1.4. Choice of exit

There are many articles dealing with the choice of the exit of a Private Equity investment, mainly venture capital. However, some papers explain the choice of Buyout's investment exit strategy. They argue that the decision and the exit strategy depend on the performance of the targets.

Lerner (1994) examined the choice of venture capital firms between raising capital through an IPO or an acquisition and concludes that venture capital firms can time the IPO market by emitting at market peaks. Baker and Wurgler (2000) find that over a 70-year period ending in 1997, the weighted annual value of a stock is negatively related to actual annual market returns. They conclude that the evidence supports Market Timing. Brau *et al.* (2003) examine the choice between an IPO and an acquisition using a sample from 1984 to 1998. They find that the "hot market" of IPOs, the cost of debt, and the size of firms are all positively correlated with the probability of an IPO

Nahata (2008) studies the exit of venture capital investments between 1991 and 2001. He finds that the probability of exit via an IPO is positively related to the volume of IPOs in the quarter preceding the exit. His study focuses on the reputation of the venture capitalist, not Market Timing. He does not use post-exit returns to test opportunism. (Poulsen and Stegemoller 2008) study the choice between an IPO and an acquisition. Their sample includes 1809 firms from 1995 to 2004. They focus on the company's own characteristics and not on global factors. In addition, IPOs are more likely for companies with greater growth opportunities and more limited capital, which are easier to value (for example, fewer intangible assets).

Steffen, M Schmidt, and Szabó (2009) analyze the determinants that influence the choice of the exit strategy. They consider a sample of 666 buyouts in Europe and the United States between 1990 and 2005. Their results show strong support for the signaling effect. If returns are very low, the LBO fund abandons the project quickly instead of keeping it in its portfolio as a living-dead buyout. Only the most profitable projects are listed on the stock market.

Stromylo and Enzmann (2017) examine the wealth effects of LBO exit from the perspective of private equity funds in terms of different exit strategies and identify how the characteristics of investment funds, such as their historical performance, their size, their experience, *etc.*, could affect the success of the exit as well as the choice of the exit strategy. They confirmed the existence of positive returns of publicly traded shares in the short term

following the announcement of the LBO exit. They also presented a new hierarchical order of exit strategies in terms of wealth generation; in first position the Trade Sales, in second position the Secondary Sales and finally, the IPOs.

## 2. Methodology

### 2.1. Data presentation

We examine a sample of 3237 buyout-backed for the 15 years period from 2004 through 2018. Our sample focuses exclusively on three European countries: The United Kingdom, France and Germany. It includes 5 exit strategies of an LBO; 216 Initial public offerings, 1392 Secondary LBOs, 1604 Trade sales and 25 others (Write Off and Buyback). This distribution is not surprising because it gives us the situation of the Private Equity-Backed Buyout market in Europe between 2004 and 2018. We obtained our sample from the Thomson One Banker database which collected 3342 buyout-backed in the United Kingdom, Germany and France over the period from 2004 through 2018.

Then, we collected the returns of the MSCI United Kingdom Equal Weighted Index, the MSCI Germany Equal Weighted Index, the MSCI France Equal Weighted Index, and the Price / Earnings Ratio (PER, or P / E) of the FTSE All Share, CAC 40 and DAX 30 from the Datastream database. As measures of economic activity, we use the annual growth rate of Gross Fixed Capital Formation (GFCF) obtained from the official website of the European Commission, the number of patents granted per year obtained from the official website of WIPO (World Intellectual Property Organization) from 1999 to 2013 and from the official EPO website (European Patent Office) for data from 2014 through 2019. Finally, the rate of bonds issued by a State (at 2 years) (namely in France, OATs (Obligations assimilables du Trésor) at 2 years; in Germany, the Bundesanleihen or Bund at 2 years old; in the United Kingdom, the 2-year Gilts) and the Consumer Confidence Indicator were collected from the Datastream database.

### 2.2. Methodology used

#### 2.2.1 Bivariate analysis

The validation of the Market Timing assumption is based on a comparison between the post-IPO returns and the post-acquisition returns as well as a comparison between their pre- and post-exit activities as the Market Timing assumption does not apply to acquisitions. Similarly, the validation of Pseudo Market Timing assumptions requires a comparison between variables related to information asymmetry, capital demand and the relative cost.

#### 2.2.2 The determinants of Initial Public Offering and acquisition waves

The determination of the factors influencing IPO and acquisitions waves requires a multivariate analysis which consists of a regression of the number of exits by an IPO or the number of exits by an acquisition over the 60-market-day window immediately after the exit on variables related to information asymmetry, capital demand, relative cost, and Market Timing. The cross-sectional regression is specified as follows:

$$\text{IPO/ACQUISITION} = \alpha_1 + \alpha_2 \text{BHR (Q-2)} + \alpha_3 \text{BHR (Q-1)} + \alpha_4 \text{BHR (Q+1)} + \alpha_5 \text{BHR (Q+2)} + \alpha_6 \text{PER} + \alpha_7 \text{GFCF} + \alpha_8 \text{Patents} + \alpha_9 \text{CCI} + \alpha_{10} \text{Bonds} + \alpha_{11} \text{Trend} + \epsilon \quad (1)$$

The independent variables are the market returns measured by the Buy and Hold Returns of the MSCI United Kingdom Equal Weighted Index, MSCI Germany Equal Weighted Index, and the MSCI France Equal Weighted Index over a 60-day window. the change in the price / earnings ratio (P/E) of the FTSE All Share (United Kingdom), CAC 40 (France) and DAX 30 (Germany); The annual growth rate of GFCF or gross fixed capital formation; The variation in the number of granted patents; The change in the consumer confidence index; 2 years treasury rates; Trend is the daily trend of time with the 01/01/2004 date defined as (1).

To assess the sensitivity of the estimates to the model specification, we started with a simple Market Timing Model (Model A) which represents the regression of the number of IPOs and acquisitions measured by the number of IPO or acquisition over a 60-day window on market returns measured by the Buy and Hold Returns of equal weighted market indexes, then, we regressed the number of exits by an IPO or the number of exits by an acquisition over the 60-market-day window immediately after the exit on variables related to information asymmetry, capital demand, relative cost, and Market Timing (Model B).

### 2.2.3 The exit strategy

In order to examine the determinants of investment fund exit choices, whether through an IPO or an acquisition, we used Probit regression. The dependent variable of the Probit model is equal to 1 for IPO exit and 0 for acquisition. The Probit model is defined as follows:

$$\text{Probit (Exit)} = \alpha_1 + \alpha_2 \text{ BHR (Q-2)} + \alpha_3 \text{ BHR (Q-1)} + \alpha_4 \text{ BHR (Q+1)} + \alpha_5 \text{ BHR (Q+2)} + \alpha_6 \text{ PER} + \alpha_7 \text{ GFCF} + \alpha_8 \text{ Patents} + \alpha_9 \text{ CCI} + \alpha_{10} \text{ Bonds} + \alpha_{11} \text{ Trend} + \alpha_{12} \text{ Log (Trend)} + \varepsilon \quad (2)$$

The independent variables are the market returns measured by the Buy and Hold Returns of the MSCI United Kingdom Equal Weighted Index, MSCI Germany Equal Weighted Index, and the MSCI France Equal Weighted Index over a 60-day window. the change in the price / earnings (P / E) ratio of the FTSE All Share, CAC 40 and DAX 30; The annual growth rate of GFCF or gross fixed capital formation; The variation in the number of granted patents; The change in the consumer confidence index; 2 years treasury rates; Trend is the daily trend of time with the 01/01/2004 date defined as (2).

## 3. Analysis of results

### 3.1. Tests and bivariate statistics

#### 3.1.1 Global sample

Table 1 lists the main variables used in the analysis by presenting averages, medians, and tests of differences between an IPO exit and an acquisition.

Table 1. Descriptive statistics and tests of mean differences between IPOs and Acquisitions

	ACQUISITIONS	IPOs	DIFF	p-value
PER	-0,69	1,30	-1,99	0.0000***
GFCF	4,09	5,07	-0,99	0.0831*
Patents	3,11	4,25	-1,14	0.0003***
CCI	3,62	6,22	-2,60	0.0000***
Bonds	2,21	5,49	-3,28	0.0000***
Equal Weighted Market returns				
BHR Q-2	2,50%	6,58%	-4,08%	0.0000***
BHR Q-1	3,19%	7,43%	-4,24%	0.0000***
BHR Q+1	1,41%	-1,16%	2,57%	0.0001***
BHR Q+2	1,60%	-3,69%	5,29%	0.0000***
Quarterly number of IPOs				
IPO Q-2	26,33	36,31	-9,98	0.0000***
IPO Q-1	25,22	37,78	-12,56	0.0000***
IPO Q+1	24,91	33,60	-8,70	0.0000***
IPO Q+2	23,07	29,79	-6,72	0.0000***
Quarterly number of Acquisitions				
Acquisition Q-2	61,56	40,93	20,64	0.0000***
Acquisition Q-1	66,11	41,04	25,07	0.0000***
Acquisition Q+1	71,46	43,78	27,68	0.0000***
Acquisition Q+2	76,52	44,03	32,50	0.0000***

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 1 lists the main variables related to information asymmetry, capital demand, relative cost, and market timing, namely the change in the price/earnings ratio (P/E) of the FTSE All Share (United Kingdom), CAC 40 (France) and DAX 30 (Germany); The annual growth rate of GFCF or gross fixed capital formation; The variation in the number of granted patents; The change in the consumer confidence index; 2 years treasury rates: In France, the rate of 2-year Treasury Bonds (OAT); in Germany, the Bundesanleihen or Bund rate at 2 years; in the United Kingdom, the "Gilts" rate at 2 years; The market returns measured by the Buy and Hold Returns of the MSCI United Kingdom Equal Weighted Index, MSCI Germany Equal Weighted Index, and the MSCI France Equal Weighted Index over a 60-day window knowing that BHR (Q-2) represent the market returns two quarters before the exit, BHR (Q-1) are the market returns during the quarter preceding the exit, BHR (Q+1) are the market returns during the first quarter after the exit and BHR (Q+2) are the market returns in the second quarter following the exit; IPO (Q-2) is the average number of IPOs two quarters before the exit, IPO (Q-1) is average number of IPOs during the quarter preceding the exit, IPO (Q+1) is average number of IPOs during the first quarter after exit and IPO (Q+2) is the average number of IPOs during the second quarter following the exit; Acquisition (Q-2) is the average number



of acquisitions two quarters before the exit, Acquisition (Q-1) is the average number of acquisitions during the quarter preceding the exit, Acquisition (Q+1) is the average number of acquisitions during the first quarter following the exit and Acquisition (Q+2) is the average number of acquisitions during the second quarter following the exit. The differences in means are tested according to the t-test.

Based on the results obtained in Table 1, the IPOs are associated with periods where: The Price Earning Ratio (PER, or P/E) is high relative to the 5-year prior historical average, the GFCF is high compared to the previous year, consumer confidence is high compared to the historical level of the previous two years, and the number of granted patents is larger than the number granted the previous year. We achieved the same results for acquisitions with the exception of the PER Ratio, which is low compared to the 5-year prior historical average.

Therefore, IPOs follow periods of overvaluation of equities in each of the two prior 60-market-day windows. However, market returns following IPOs are negative and lower than post-acquisition returns. However, the difference in quarterly post-exit returns between IPOs and acquisitions is economically significant and statistically significant at the 1% level. This significant difference after the exit is the first indication that issuers are successful in timing the IPO market, that is, they are able to time issues to occur during periods of investor over-optimism.

The results obtained in Table 2, relating to the test of the difference between the quarterly returns and activity levels of LBOs before and after the exit, correspond to the statistics of the quarterly averages given in Table 1. Table 1 shows that market returns during the two quarters preceding the IPO are statistically higher for IPOs than for acquisitions and that market returns fall during the study period in both exit cases. Nevertheless, this decline is much greater for IPOs than for acquisitions. Indeed, post-IPO returns are negative and lower than post-acquisition returns, which remain positive. Correspondingly, Table 2 shows that, in the case of IPOs, pre-exit returns are significantly higher than post-exit returns, indicating that IPOs are following periods of market run-up. We note the same evolution of returns in the case of acquisitions.

The results in Table 1 show that IPOs tend to occur near peaks of IPO activity and low growth in the number of acquisitions compared to acquisitions. These tend to occur as the number of acquisitions increases, and when the number of IPOs is in low decline.

Table 2 presents the results of the tests of significance of these differences, which show that IPOs tend to occur during periods when acquisition activity is rising and during the peaks of IPOs. Acquisitions tend to occur during periods when acquisition activity is increasing and IPO activity is decreasing.

Table 2. Comparison of quarterly Market Returns and quarterly activity of IPOs and acquisitions pre-and post-exit and Mean Difference Tests

Quarterly BHRs						
	IPO			ACQUISITION		
Comparison	Diff	t-stat	p-value	Diff	t-stat	p-value
Exit-1 v. Exit+1	8,59%	12.1009	0.0000***	4,00%	8.1207	0.0000***
Exit-1 v. Exit+2	11,12%	13.8935	0.0000***	2,34%	6.3583	0.0000***
Exit-2 v. Exit+1	7,74%	11.4427	0.0000***	1,09%	4.4111	0.0000***
Exit-2 v. Exit+2	10,27%	13.0898	0.0000***	0,90%	3.2193	0.0013***
Quarterly number of IPOs						
	IPO			ACQUISITION		
Comparison	Diff	t-stat	p-value	Diff	t-stat	p-value
Exit-1 v. Exit+1	4,18	4.0558	0.0001***	0,31	1.6162	0.1062
Exit-1 v. Exit+2	8,00	6.6042	0.0000***	2,15	11.3745	0.0000***
Exit-2 v. Exit+1	2,70	2.7049	0.0074 ***	1,42	7.2877	0.0000***
Exit-2 v. Exit+2	6,52	7.2296	0.0000***	3,26	13.2520	0.0000***
Quarterly number of acquisitions						
	IPO			ACQUISITION		
Comparison	Diff	t-stat	p-value	Diff	t-stat	p-value
Exit-1 v. Exit+1	-2,74	-3.9504	0.0001***	-5,35	-26.5721	0.0000***
Exit-1 v. Exit+2	-2,99	-2.6950	0.0000***	-10,41	-42.7066	0.0000***
Exit-2 v. Exit+1	-2,86	-3.4969	0.0006***	-9,90	-53.7257	0.0000***
Exit-2 v. Exit+2	-3,10	-2.7920	0.0057***	-14,96	-60.0478	0.0000***

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 2 presents the results of difference test between quarterly market returns and quarterly activity of IPOs and acquisitions Pre- and Post-Exit. Market returns are Buy and Hold Returns of the MSCI United Kingdom Equal Weighted Index, MSCI Germany Equal Weighted Index, and the MSCI France Equal Weighted Index over a

60-day window. IPO and acquisition activity are measured as numbers of exits over 60-market-day windows around the exit. Tests of before versus-after differences within an exit type are t-tests of the before versus after exit event quarterly data for IPO exits and acquisition exits.

In summary, the bivariate results provide strong support for the Market Timing as well as the Pseudo Market Timing. Market returns in the two quarters preceding IPOs are higher than post-IPO returns. Post-exit returns are negative, and there is a statistically significant difference in post-exit market returns between IPOs and acquisitions. Indeed, post-IPO returns are negative and lower than post-acquisition returns. Post-acquisition returns are also lower than pre-acquisition returns, although this difference is not significant enough. These results support Market Timing assumptions. On the other hand, the evidence of pseudo market timing is concluded from the positive relationship between IPO activity and market conditions variables.

### 3.1.2. Country analysis (France, Germany and the United Kingdom)

Table 3 presents a comparison of descriptive statistics and results of the average difference tests between the 3 countries, namely France, Germany and the United Kingdom.

The results obtained for IPOs are similar in the 3 countries and confirm the results obtained for the overall sample. In fact, IPOs are associated with periods where: The price earning ratio (PER or P/E) is higher than to the 5-year prior historical average, the GFCF is high compared to the previous fiscal year, consumer confidence is high compared to the 2-year prior historical average, and the number of patents granted is larger than the number granted the previous year. Acquisitions are also associated with the same conditions as IPOs in France. However, the results are the same for Germany and the United Kingdom except for the PER Ratio which is lower than the 5-year prior historical average.

Based on the results in Table 3, pre-IPO market returns are positive and higher than pre-acquisition market returns. However, post-IPO market returns become negative and lower than post-acquisition returns. The difference in quarterly post-exit returns between IPOs and acquisitions is statistically significant in the 3 countries. This supports the results of the global sample and confirms that issuers are able to time issues to occur during periods of investor over-optimism that is, they succeed in Market Timing.

Table 3 lists for each country, namely France, Germany and the United Kingdom, the main variables related to information asymmetry, capital demand, relative cost, and market timing: the change in the price/earnings ratio (P/E) of the FTSE All Share (United Kingdom), CAC 40 (France) and DAX 30 (Germany); The annual growth rate of GFCF or gross fixed capital formation; The variation in the number of granted patents; The change in the consumer confidence index; 2 years treasury rates: In France, the rate of 2-year Treasury Bonds (OAT); in Germany, the Bundesanleihen or Bund rate at 2 years; in the United Kingdom, the "Gilts" rate at 2 years; The market returns measured by the Buy and Hold Returns of the MSCI United Kingdom Equal Weighted Index, MSCI Germany Equal Weighted Index, and the MSCI France Equal Weighted Index over a 60-day window knowing that BHR (Q-2) represent the market returns two quarters before the exit, BHR (Q-1) are the market returns during the quarter preceding the exit, BHR (Q+1) are the market returns during the first quarter after the exit and BHR (Q+2) are the market returns in the second quarter following the exit; IPO (Q-2) is the average number of IPOs two quarters before the exit, IPO (Q-1) is average number of IPOs during the quarter preceding the exit, IPO (Q+1) is average number of IPOs during the first quarter after exit and IPO (Q + 2) is the average number of IPOs during the second quarter following the exit; Acquisition (Q-2) is the average number of acquisitions two quarters before the exit, Acquisition (Q-1) is the average number of acquisitions during the quarter preceding the exit, Acquisition (Q+1) is the average number of acquisitions during the first quarter following the exit and Acquisition (Q+2) is the average number of acquisitions during the second quarter following the exit. The differences in means are tested according to the t-test.

Table 3. Descriptive statistics and tests of mean differences between IPOs and Acquisitions by country (France, Germany and United Kingdom)

	France				Germany				United Kingdom			
	ACQUISITION	IPO	DIFF	p-value	ACQUISITION	IPO	DIFF	p-value	ACQUISITION	IPO	DIFF	p-value
N	959	63			671	57			1391	96		
PER	0,70	2,32	-1,62	0.0000***	-0,03	2,16	-2,19	0.0000***	-0,88	1,00	-1,87	0.0000***
GFCF	3,50	4,12	-0,62	0.2526	5,47	5,94	-0,47	0.3953	4,03	6,23	-2,20	0.0199**
Patents	3,81	5,07	-1,26	0.0000***	5,13	5,74	-0,61	0.0453**	1,41	3,33	-1,92	0.0010***
CCI	4,29	4,52	-0,23	0.7796	2,89	6,92	-4,02	0.0015***	2,83	6,67	-3,84	0.0000***
Bonds	2,56	5,02	-2,45	0.0000***	2,37	4,96	-2,59	0.0000***	3,26	5,12	-1,86	0.0000***
Quarterly BHRs												
BHR Q-2	3,55%	8,87%	-5,32%	0.0000***	3,72%	5,29%	-1,57%	0.2986	1,43%	6,31%	-4,88%	0.0000***
BHR Q-1	3,46%	7,65%	-4,19%	0.0000***	4,55%	5,95%	-1,40%	0.0006***	1,89%	7,66%	-5,77%	0.0000***
BHR Q+1	2,05%	-0,97%	3,01%	0.0302**	2,25%	-1,82%	4,08%	0.0151**	1,15%	-0,67%	1,82%	0.0092***
BHR Q+2	2,13%	-3,77%	5,90%	0.0001***	2,56%	-5,04%	7,60%	0.0000***	0,78%	-2,96%	3,74%	0.0002***
Quarterly number of IPOs												
IPO Q-2	25,30	34,03	-8,73	0.0000***	18,06	29,19	-11,13	0.0000***	35,58	46,90	-11,32	0.0000***
IPO Q-1	24,21	35,67	-11,45	0.0000***	17,72	30,23	-12,50	0.0000***	35,14	47,18	-12,03	0.0000***
IPO Q+1	23,48	29,84	-6,37	0.0000***	16,36	25,79	-9,43	0.0000***	33,90	43,85	-9,96	0.0000***
IPO Q+2	21,69	29,83	-8,13	0.0000***	16,75	25,07	-8,32	0.0000***	32,32	32,79	-0,48	0.7767
Quarterly number of acquisitions												
Acquisition Q-2	55,80	35,77	20,03	0.0000***	55,73	39,00	16,73	0.0000***	70,61	47,09	23,51	0.0000***
Acquisition Q-1	63,19	35,31	27,88	0.0000***	62,42	39,75	22,68	0.0000***	71,59	49,51	22,08	0.0000***
Acquisition Q+1	68,07	37,69	30,38	0.0000***	68,70	41,18	27,53	0.0000***	75,84	51,49	24,35	0.0000***
Acquisition Q+2	70,81	38,43	32,38	0.0000***	70,12	41,80	28,32	0.0000***	78,18	51,72	26,46	0.0000***

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The results in Table 4, regarding the test of the difference between the quarterly returns and activity levels of the LBOs before and after the exit, correspond to the statistics of the quarterly averages in Table 3 and are similar to the statistics in the global sample presented in Table 2.

Indeed, according to Table 4, the pre- IPO returns are significantly higher than the post-IPO returns, indicating that IPOs are following periods of market growth. We note the same evolution of returns in the case of acquisitions; the results obtained are all statistically significant.

According to the statistics obtained in Table 3, the IPOs tend to happen near peaks of IPO activity in France and the UK while in Germany the IPOs tend to occur during periods when the IPO activity is rising. However, acquisitions tend to occur when the IPO activity is declining in the three countries. Nevertheless, the number of IPOs before and after an IPO is still greater than the number of IPOs before and after an acquisition. This difference is statistically significant at the 1% level in the 3 countries. The results also show that the IPOs occur during periods of weak growth of the acquisition activity compared to acquisitions that tend to occur during periods of strong growth of the acquisition activity. This difference is statistically significant at the 1% level in the 3 countries. These results support those found previously regarding the overall sample.

Table 4 also presents the results of the tests of differences between the IPO and acquisition activity during the two quarters preceding the exit compared to the IPO and acquisition activity during the two quarters following the exit in the 3 countries. These results show that IPOs tend to occur during periods when the acquisition activity is increasing and near peaks of IPO activity while acquisitions tend to occur during periods when the acquisition activity is increasing and the IPO activity is decreasing by confirming the significance of the differences between the quarterly activity of IPOs and acquisitions before and after the exit at the 1% level in almost all the cases presented in Table 4. These findings are valid for the 3 countries and confirm the Market Timing assumptions previously validated by the global sample.

The analysis of the descriptive statistics and the tests of differences of averages support the Market Timing hypothesis as well as the Pseudo Market Timing hypothesis which are verifiable in the case of the global sample as well as in the case of each country. Thus, our results, at this stage, are in harmony, on one side, with those of Ball *et al.* (2011) and Butler *et al.* (2005), who find evidence of global Pseudo Market Timing, and in other side with those of Lerner (1994), Baker and Wurgler (2000), and Lowry (2003) who found, in their regression models, negative relationships between IPO activity and post-IPO market returns and confirmed the existence of Market Timing. However, our results are similar to those of Wadhwa and Reddy Syamala (2018) who found that in India, firms issue equity not just due to market conditions but they also issue equity in order to time the market.

Table 4. Comparison of quarterly Market Returns and quarterly activity of IPOs and acquisitions pre-and post-Exit and Mean Difference Tests by country (France, Germany and United Kingdom)

Panel A: IPOs

	France			Germany			United Kingdom		
<b>Quarterly BHRs</b>									
Comparison	Diff %	t-stat	p-value	Diff %	t-stat	p-value	Diff %	t-stat	p-value
Exit-1 v. Exit+1	8,62	10,7458	0,0000***	7,77	5,0193	0,0000***	8,33%	9,1961	0,0000***
Exit-1 v. Exit+2	11,42	5,8038	0,0000***	10,98	4,9436	0,0000***	10,62%	11,9516	0,0000***
Exit-2 v. Exit+1	9,83	9,9528	0,0000***	7,11	4,8655	0,0000***	6,98%	8,6638	0,0000***
Exit-2 v. Exit+2	12,64	6,8025	0,0000***	10,33	4,7541	0,0000***	9,28%	10,7763	0,0000***
<b>Average quarterly number of IPO</b>									
Comparison	Diff %	t-stat	p-value	Diff %	t-stat	p-value	Diff %	t-stat	p-value
Exit-1 v. Exit+1	5,83	6,1778	0,0000***	4,44	3,6347	0,0000***	3,32	1,7985	0,0753*
Exit-1 v. Exit+2	5,84	5,6804	0,0000***	5,16	8,4419	0,0000***	14,39	5,8939	0,0000***
Exit-2 v. Exit+1	4,19	4,4069	0,0000***	3,40	5,3461	0,0000***	3,04	2,1501	0,0341**
Exit-2 v. Exit+2	4,21	2,9889	0,0000***	4,12	4,7565	0,0000***	14,10	7,0441	0,0000***
<b>Average quarterly number of acquisitions</b>									
Comparison	Diff %	t-stat	p-value	Diff %	t-stat	p-value	Diff %	t-stat	p-value
Exit-1 v. Exit+1	-2,38	-2,3302	0,0231**	-1,43	-1,8572	0,0685*	-1,98	-1,9296	0,0566*
Exit-1 v. Exit+2	-3,13	-2,4104	0,0189**	-2,05	-2,3403	0,0229**	-2,21	-1,197	0,2343
Exit-2 v. Exit+1	-1,92	-1,6181	0,1107	-2,18	-2,9463	0,0047***	-4,40	-3,5333	0,0006***
Exit-2 v. Exit+2	-2,67	-1,803	0,0762*	-2,81	-3,3925	0,0013***	-4,63	-2,525	0,0132**

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Panel B: Acquisitions

	France			Germany			United Kingdom		
Quarterly BHRs									
Comparison	Diff %	t-stat	p-value	Diff %	t-stat	p-value	Diff	t-stat	p-value
Exit-1 v. Exit+1	1,42	3,9647	0,0001***	2,30	4,8081	0,0000***	0,73	3,0632	0,0022***
Exit-1 v. Exit+2	1,33	3,5449	0,0004***	1,99	4,2571	0,0000***	1,11	3,5818	0,0004***
Exit-2 v. Exit+1	1,50	4,0921	0,0000***	1,47	2,2679	0,0237**	0,28	0,9379	0,3485
Exit-2 v. Exit+2	1,42	3,7756	0,0002***	1,16	1,816	0,0698*	0,65	1,822	0,0687*
Average quarterly number of IPO									
Comparison	Diff	t-stat	p-value	Diff	t-stat	p-value	Diff	t-stat	p-value
Exit-1 v. Exit+1	0,74	3,1741	0,0016***	1,36	5,3682	0,0000***	1,25	3,2785	0,0011***
Exit-1 v. Exit+2	2,52	10,382	0,0000***	0,97	4,9396	0,0000***	2,83	7,3219	0,0000***
Exit-2 v. Exit+1	1,83	7,1825	0,0000***	1,70	8,9148	0,0000***	1,69	4,2802	0,0000***
Exit-2 v. Exit+2	3,61	12,7159	0,0000***	1,31	5,0453	0,0000***	3,26	6,6681	0,0000***
Average quarterly number of acquisitions									
Comparison	Diff	t-stat	p-value	Diff	t-stat	p-value	Diff	t-stat	p-value
Exit-1 v. Exit+1	-4,87	-19,1164	0,0000***	-6,28	-29,3802	0,0000***	-4,25	-8,0394	0,0000***
Exit-1 v. Exit+2	-7,62	-24,2681	0,0000***	-7,70	-28,6615	0,0000***	-6,59	-18,768	0,0000***
Exit-2 v. Exit+1	-12,26	-38,8978	0,0000***	-12,98	-32,3556	0,0000***	-5,23	-10,156	0,0000***
Exit-2 v. Exit+2	-15,01	-45,8164	0,0000***	-14,39	-35,188	0,0000***	-7,57	-25,7035	0,0000***

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 4 presents the results of difference test between quarterly market returns and quarterly activity of IPOs (Panel A) and acquisitions (Panel B) Pre- and Post-Exit in France, Germany and United Kingdom. Market returns are Buy and Hold Returns of the MSCI United Kingdom Equal Weighted Index, MSCI Germany Equal Weighted Index, and the MSCI France Equal Weighted Index over a 60-day window. IPO and acquisition activity are measured as numbers of exits over 60-market-day windows around the exit. Tests of before versus-after differences within an exit type are t-tests of the before versus after exit event quarterly data for IPO exits and acquisition exits.

### 3.2. Determinants of IPOs and acquisitions waves

#### 3.2.1 Global sample

Based on the results of the regression of the number of IPOs and acquisitions measured by the number of exits by an IPO or the number of exits by an acquisition over the 60-market-day window immediately after the exit on information asymmetry, capital demand, relative cost, and Market Timing in Table 5, IPOs follow market run-ups. These results provide significant evidence that LBO issuers are able to time issues to occur in anticipation of market returns that are lower than would be implied by simple mean reversion. Indeed, the relationship between the number of IPOs in the first quarter following the IPO and the market returns during the two quarters preceding the IPO is positive and statistically significant (Model (A)).

Table 5. Determinants of IPOs and acquisitions quarterly activities

VARIABLES	IPOs		Acquisition	
	Model A	Model B	Model A	Model B
BHRQ1	23.40*** (2.425)	23.28** (11.59)	9.334*** (2.783)	16.23** (6.414)
BHRQ2	39.26*** (2.706)	26.62** (12.35)	3.723 (2.774)	14.32*** (2.092)
BHRQ3	-51.85*** (5.136)	-38.46*** (10.69)	6.642** (2.788)	-7.334 (740.1)
BHRQ4	-24.52*** (4.134)	-22.53** (8.788)	20.98*** (2.265)	12.55*** (3.751)
PER		4.829*** (0.431)		-3.062 (4.369)
GFCF		1.082*** (0.165)		-7.995*** (1.338)
Patents		9.245*** (2.666)		1.057*** (0.0583)
CCI		2.675***		-0.563***

VARIABLES	IPOs		Acquisition	
	Model A	Model B	Model A	Model B
		(0.497)		(0.197)
Bonds		2.547*** (0.787)		3.557*** (0.147)
Trend	0.0489*** (0.00587)	-0.586 (0.380)	0.0114*** (0.000378)	0.0152*** (0.000250)
Constant	0.962 (2.537)	20.81** (8.064)	47.61*** (0.636)	32.69*** (1.859)
Observations	216	216	3,021	3,021
R-squared	0.691	0.699	0.258	0.703

Note: Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 5 presents the results of the regression of the number of exits by an IPO or the number of exits by an acquisition over the 60-market-day window immediately after the exit on variables related to information asymmetry, capital demand, relative cost, and Market Timing. The cross-sectional regression is specified as follows:

$$\text{IPO/ACQUISITION} = \alpha_1 + \alpha_2 \text{BHR (Q-2)} + \alpha_3 \text{BHR (Q-1)} + \alpha_4 \text{BHR (Q+1)} + \alpha_5 \text{BHR (Q+2)} + \alpha_6 \text{PER} + \alpha_7 \text{GFCF} + \alpha_8 \text{Patents} + \alpha_9 \text{CCI} + \alpha_{10} \text{Bonds} + \alpha_{11} \text{Trend} + \varepsilon \quad (1)$$

The independent variables are the market returns measured by the Buy and Hold Returns of the MSCI United Kingdom Equal Weighted Index, MSCI Germany Equal Weighted Index, and the MSCI France Equal Weighted Index over a 60-day window knowing that BHR (Q-2) represent the market returns two quarters before the exit, BHR (Q-1) are the market returns during the quarter preceding the exit, BHR (Q+1) are the market returns during the first quarter after the exit and BHR (Q+2) are the market returns in the second quarter following the exit. the change in the price/earnings ratio (P/E) of the FTSE All Share (United Kingdom), CAC 40 (France) and DAX 30 (Germany); The annual growth rate of GFCF or gross fixed capital formation; The variation in the number of granted patents; The change in the consumer confidence index; 2 years treasury rates: In France, the rate of 2-year Treasury Bonds (OAT); in Germany, the Bundesanleihen or Bund rate at 2 years; in the United Kingdom, the "Gilts" rate at 2 years ; Trend is the daily trend of time with the 01/01/2004 date defined as 1.

Despite the existence of statistical significance, the estimated relationships between the IPO activity and post-IPO market returns have negligible economic significance. Indeed, since we measure the number of exits during an interval of 60 days from the exit date, the returns of the Q+1 quarter overlap with the dependent variable. Thus Q+2 returns are a more appropriate measure of Market Timing (Ball, Chiu and Smith 2011). The coefficients of market return in the second quarter following the IPO are negative and statistically significant at the 1% level in model (A), *i.e* the increase in the number of IPOs is followed by a drop in market returns during the second quarter post-exit. These results support the hypothesis that investment funds choose an exit through an IPO in anticipation of a decline in market returns which still provides strong support for the practice of Market Timing.

Model (B) adds the change in the number of patents granted during the two years preceding the exit and the change in the gross fixed capital formation of the calendar year of the exit from the previous calendar year. These variables are related to both the rate of scientific progress and the capital demand to finance growth. They are among the factors that can give rise to the model of Pseudo Market Timing. The results of the IPOs in model (B) indicate that IPO activity is higher after the increase of the inventive activities presented by the increase of the number of patents granted during the two years preceding the exit and the annual economic growth represented by the annual growth of the gross fixed capital formation. The acquisition activity is also higher after the increase of the number of patents granted, but it is negatively related to the variation in the GFCF. During these periods, existing businesses may be more likely to focus on internally generated projects and may have less capital available to finance acquisitions. Thus, acquisitions in these periods are less likely to provide growth capital to the acquired company. These results support capital demand and information asymmetry approach. Acquisitions are more likely when investment activity is low, suggesting that acquisition can help to overcome the information asymmetry that is an obstacle to IPOs.

In the model (B), we also include the change in the price/earnings ratio (P/E) of the market index (the average of the previous 60 days minus the average of the previous 5 years). Pseudo Market Timing implies that issuers of IPOs may attempt to issue after the rise in the price/earnings (P/E) ratio of the market index. But a high P/E ratio may also indicate an increase in growth opportunities. Thus, companies can issue securities during this period because their capital requirement is high. The results obtained from the regression of the number of IPOs are in line with these expectations. Indeed, the relationship between the IPO activity during the first quarter following

the IPO and the change in the price/earning ratio (P/E) is positive and statistically significant at the 1% level. The lack of a significant relationship between the number of acquisitions during the first quarter following acquisition and the change in the price/earning ratio is consistent with the idea that IPO issuers may attempt to time the IPO market, but the effort does not extend to the acquisition market.

The Treasury bill rate at the time of exit is a determinant of the capital cost and should be higher when the capital demand is high. During periods of high demand, companies may use IPOs because the growth capital available through acquisitions is more limited. The relationship between the number of IPOs and the treasury bill rate has significant economic significance and is statistically significant at the 1% level. This relationship persists in the case of acquisitions. Such a result was not predictable. There is no apparent reason for the behavior of managers. Indeed, why resort to acquisitions that provide limited growth capital instead of IPOs? This result confirms the inability of investment funds to be good Market Timers. However, the results obtained in the case of IPOs on the Treasury bill rate are consistent with the idea that the costs of adverse selection are lower when the economy is growing.

The relationship between the consumer confidence index and the number of exits through an IPO is positive and statistically significant at the 1% level, while the relationship between the consumer confidence index with the number of exits through an acquisition is negative and statistically significant at the 1% level. The results suggest that the consumer confidence index is also linked to periods of increased investment and low information asymmetry. Companies looking to exit seem to opt for acquisition when the consumer confidence index is down and the market may be less able to perceive favorable opportunities for raising capital. During periods of low consumer confidence, buyers may find unattractive opportunities generated internally.

The results of the regression of the number of IPOs and acquisitions measured by the number of exits by an IPO or the number of exits by an acquisition over the 60-market-day-window immediately after the exit on information asymmetry, capital demand, relative cost and Market Timing presented in Table 5 show that all variables have a significant impact on the IPO activity. That is, IPOs are not only the result of Market Timing, but are also affected by Market Conditions.

### *3.2.2. Country analysis (France, Germany and the United Kingdom)*

The results obtained in both model A and B of the IPOs presented in Table (6) show that the relationship between the number of IPOs during the first quarter following IPO and the market returns during the two preceding quarters is positive and statistically significant at the 1% and 5% level. Thus, the country regression confirms that IPOs follow periods of market growth. Nevertheless, this relationship becomes statistically negative following the IPO at the 1% and 5% level, that is the increase in the number of IPOs is followed by a fall in market returns during the two quarters following the exit. These results provide significant evidence that LBO-financed companies can time IPOs in anticipation of lower market returns than a return to the average. Again, Market Timing's assumptions have been validated by the evidence obtained in the case of IPOs in France, Germany and the United Kingdom.

In the case of France, the coefficient associated with economic growth presented by the annual growth of gross fixed capital formation and the coefficient associated with capital demand presented by the PER are positive and statistically significant. Thus, the IPOs in France, are closely related to the quarterly returns of the stock market and to the economic growth that is part of the factors that can give rise to the model of Pseudo Market Timing. For acquisitions, the results of which appear in panel (B) of Table (6), follow periods of rising market returns before and after exit transactions. Indeed, there is a positive and statistically significant relationship at the 1% level between the number of acquisitions and the quarterly returns before and after acquisitions. The relationship between the acquisition activity and the change in the P/E ratio is negative and statistically significant at the 1% level. This relationship confirms the ability of issuers to time the IPO market as well as the acquisition market. The acquisition activity is also negatively and statistically linked to GFCF and the consumer confidence factor. However, it is significantly and positively related to inventive activity and treasury bill rates. The significance of the relationship between the number of acquisitions and the different variables in Model (B) shows that issuers provide more effort to anticipate the acquisition market conditions, in contrast to the effort to anticipate IPO market conditions. In summary, the French model provides strong support for Market Timing at the expense of Pseudo Market Timing.

Based on the results of the regression of the German Model (B), the relationship between the number of IPOs in the first quarter following the IPO and the change in Price/Earning (P/E) ratio is positive and statistically significant at the 1% level. Market Timing implies that issuers of IPOs could attempt to issue after the rise in the price / earnings ratio (P/E) of the market index, which is the case for German issuers. The relationship between the consumer confidence index and the number of exits through an IPO is positive and statistically significant at the % level. This is reflected in the fact that the IPOs are linked to periods of increased investment and low information

asymmetry presented by the rise in the consumer confidence index. The relationship between the number of IPOs and the Treasury bill rate has significant economic significance and is statistically significant at the 1% level. The results obtained on treasury bills rates are consistent with the idea that IPOs tend to occur during periods when the costs of adverse selection are low that is when the economy is growing.

The results of the German acquisition model (B) are similar to the results of the French acquisition model (B) which supports the fact that issuers are excellent Market Timers. Indeed, there is a positive and statistically significant relationship at the 1% level between the number of acquisitions and the quarterly returns before and after acquisitions. Acquisition activity is statistically and positively related to patent variation and treasury bond rates but negatively related to P/E ratio change, economic growth and confidence index consumers. Thus, the German model has strong support for Market Timing and partly supports Pseudo Market Timing's assumptions.

The results of the UK IPOs model (B) are close to the results of the IPO Model (B) of the overall sample in Table 5. Indeed, the IPOs are linked to the periods of increase in growth opportunities presented by the rise in the P/E Ratio, so there is a positive and statistically significant relationship at the 1% level between the number of IPOs and the P/E Ratio. IPOs are also linked to the period of economic growth represented by annual growth in GFCF, which is positive and statistically significant at the 1% level. They are significantly and positively related to inventive activity. The IPO activity is much more important when the consumer confidence index is high given the positive and statistically significant relationship at the 1% level between the number of IPOs and the consumer confidence index. Finally, there is a positive and statistically significant relationship at the 1% level between the number of IPOs and the treasury bill rate, that is, the activity of the IPOs is linked to the increase in the demand for capital.

Table 6 presents a comparison of the results of the regression of the number of exits by an IPO or the number of exits by an acquisition over the 60-market-day window immediately after the exit on variables related to information asymmetry, capital demand, relative cost, and Market Timing between France, Germany and the United Kingdom. The cross-sectional regression is specified as follows:

$$\text{IPO/ACQUISITION} = \alpha_1 + \alpha_2 \text{BHR (Q-2)} + \alpha_3 \text{BHR (Q-1)} + \alpha_4 \text{BHR (Q+1)} + \alpha_5 \text{BHR (Q+2)} + \alpha_6 \text{PER} + \alpha_7 \text{GFCF} + \alpha_8 \text{Patents} + \alpha_9 \text{CCI} + \alpha_{10} \text{Bonds} + \alpha_{11} \text{Trend} + \varepsilon \quad (1)$$

The independent variables are the market returns measured by the Buy and Hold Returns of the MSCI United Kingdom Equal Weighted Index, MSCI Germany Equal Weighted Index, and the MSCI France Equal Weighted Index over a 60-day window knowing that BHR (Q-2) represent the market returns two quarters before the exit, BHR (Q-1) are the market returns during the quarter preceding the exit, BHR (Q+1) are the market returns during the first quarter after the exit and BHR (Q+2) are the market returns in the second quarter following the exit. the change in the price / earnings ratio (P/E) of the FTSE All Share (United Kingdom), CAC 40 (France) and DAX 30 (Germany); The annual growth rate of GFCF or gross fixed capital formation; The variation in the number of granted patents; The change in the consumer confidence index; 2 years treasury rates: In France, the rate of 2-year Treasury Bonds (OAT); in Germany, the Bundesanleihen or Bund rate at 2 years; in the United Kingdom, the "Gilts" rate at 2 years ; Trend is the daily trend of time with the 01/01/2004 date defined as 1.



Table 6. Determinants of IPOs and acquisitions quarterly activities by country (France, Germany and United Kingdom)

VARIABLES	France				Germany				United Kingdom			
	IPOs		Acquisitions		IPOs		Acquisitions		IPOs		Acquisitions	
	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B
BHRQ1	4.413** (2.039)	8.270*** (2.112)	14.75*** (1.697)	18.03*** (1.693)	5.785*** (1.365)	6.693*** (0.950)	2.851*** (0.123)	2.867*** (0.132)	6.916*** (2.086)	9.333*** (1.584)	21.14*** (2.577)	16.45*** (2.328)
BHRQ2	6.098** (2.406)	8.824*** (2.230)	20.69*** (3.595)	32.60*** (3.720)	4.407*** (1.185)	3.979*** (0.977)	4.981*** (0.350)	6.634*** (0.637)	5.957*** (2.258)	8.818*** (1.563)	12.50*** (1.329)	4.136*** (1.513)
BHRQ3	-0.696*** (0.127)	-0.756*** (0.216)	15.23*** (2.024)	12.34*** (2.101)	-7.646*** (1.286)	-5.420*** (1.123)	3.019*** (0.439)	3.299*** (0.457)	-0.809*** (0.170)	-1.284*** (0.147)	17.16*** (3.929)	10.42*** (3.364)
BHRQ4	-5.120*** (0.688)	-7.955*** (1.263)	7.427*** (1.955)	9.871*** (2.265)	-6.252*** (1.452)	-5.171*** (0.910)	7.598*** (1.560)	5.354*** (1.681)	-4.304*** (0.637)	-7.356*** (0.734)	12.05*** (0.448)	3.647*** (0.492)
PER		2.045** (0.916)		-0.550*** (0.137)		3.430*** (0.637)		-0.108** (0.0525)		3.606*** (0.595)		-0.139 (0.149)
GFCF		4.075*** (1.304)		-0.400*** (0.102)		-0.197 (0.157)		-4.550*** (1.326)		0.434*** (0.135)		-8.719*** (2.331)
Patents		6.339 (4.350)		0.799*** (0.139)		0.622 (2.927)		0.0687** (0.0272)		4.178* (2.214)		0.996*** (0.162)
CCI		4.727 (14.15)		-0.357*** (0.0480)		42.77*** (10.16)		-0.487*** (0.0812)		69.68*** (17.03)		0.146*** (0.0405)
Bonds		-1.520 (1.622)		1.416*** (0.429)		5.183*** (0.806)		5.459*** (1.316)		2.389*** (0.881)		7.267*** (0.299)
Trend	-0.00184*** (0.000488)	-0.000449 (0.000480)	0.0215*** (0.000937)	0.0388*** (0.00215)	-0.00295** (0.00133)	-0.00140 (0.000859)	1.620 (1.308)	-0.406 (1.495)	0.200*** (0.0638)	0.139** (0.0594)	-0.0253*** (0.000884)	0.00957*** (0.00218)
Constant	31.95*** (3.262)	16.45** (8.100)	45.20*** (0.831)	36.71*** (2.333)	66.17*** (2.369)	32.71*** (4.740)	-29.64*** (1.400)	-25.65*** (1.481)	23.59*** (5.192)	13.27** (5.242)	88.48*** (0.594)	42.94*** (1.737)
Observations	63	63	959	959	57	57	671	671	96	96	1,391	1,391
R-squared	0.817	0.889	0.460	0.562	0.669	0.900	0.599	0.645	0.743	0.900	0.529	0.711

Note: Standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

According to the UK Acquisition Model (A), the relationship between the acquisition activity and market returns around the exit is statistically significant which confirms the relation between the acquisition activity and market returns which is positive and statistically significant at the 1% level during the 4 quarters. The significance and the signs of the coefficients of the other variables namely the variation of the P/E ratio, the variation of the patents granted, the economic growth, the consumer confidence index and the treasury bill rate are similar to the results of the acquisition Model (B) of the overall sample. This allows us to say that the results obtained confirm the practice of Market Timing in the United Kingdom.

France provides strong evidence of market timing and pseudo market timing against Germany and UK which provide strong evidence of market timing and moderate evidence of pseudo market timing.

### 3.3. The exit strategy

#### 3.3.1 Overall sample

After a study of the relationship between the IPO and acquisition activity by quarterly interval and variables related to information asymmetry, capital demand, relative cost, and Market Timing (at Table 5), we proceed by a regression of a Probit model whose results appear in Table (7), to examine the exit choices. The dependent variable of the Probit model is equal to 1 when it is an exit via an IPO and 0 during an acquisition. Similar to the previous regression, and to assess the sensitivity of the estimates to the model specification, we used a simple Probit model of Market Timing (Model A) whose independent variables are the market returns measured by Buy and Hold Return of the equally weighted index, then we added the rest of the variables related to information asymmetry, capital demand and relative cost in the second model (model (B)).

In most respects, the results obtained confirm previous results. Model (B) in Table 7 shows the same results as Model (B) in Table 5.

Table 7. Probit model of choice of exit strategy: IPO vs Acquisition

VARIABLES	Model A	Model B
BHRQ1	2.708*** (0.494)	1.062*** (0.202)
BHRQ2	1.519*** (0.397)	0.576*** (0.223)
BHRQ3	-1.749*** (0.428)	-8.906 (18.18)
BHRQ4	-2.813*** (0.482)	-0.745*** (0.218)
PER		0.599*** (0.123)
GFCF		0.936*** (0.171)
Patents		0.587*** (0.117)
CCI		0.357*** (0.0804)
Bonds		0.935*** (0.213)
Trend	-0.000770*** (7.18e-05)	-0.00642*** (0.000882)
Constant	3.198*** (0.150)	19.14*** (2.675)
Observations	3,237	3,237

Note: Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 7 presents the results of the Probit regression whose dependent variable equal to 1 for IPO exit and 0 for acquisition. The Probit model is defined as follows:

$$\text{Probit (Exit)} = \alpha_1 + \alpha_2 \text{ BHR (Q-2)} + \alpha_3 \text{ BHR (Q-1)} + \alpha_4 \text{ BHR (Q+1)} + \alpha_5 \text{ BHR (Q+2)} + \alpha_6 \text{ PER} + \alpha_7 \text{ GFCF} + \alpha_8 \text{ Patents} + \alpha_9 \text{ CCI} + \alpha_{10} \text{ Bonds} + \alpha_{11} \text{ Trend} + \alpha_{12} \text{ Log (Trend)} + \varepsilon \quad (2)$$

The independent variables are the market returns measured by the Buy and Hold Returns of the MSCI United Kingdom Equal Weighted Index, MSCI Germany Equal Weighted Index, and the MSCI France Equal Weighted Index over a 60-day window knowing that BHR (Q-2) represent the market returns two quarters before the exit, BHR (Q-1) are the market returns during the quarter preceding the exit, BHR (Q+1) are the market returns during the first quarter after the exit and BHR (Q+2) are the market returns in the second quarter following the exit. the change in the price/earnings ratio (P/E) of the FTSE All Share (United Kingdom), CAC 40 (France) and DAX 30 (Germany); The annual growth rate of GFCF or gross fixed capital formation; The variation in the number of granted patents; The change in the consumer confidence index; 2 years treasury rates: In France, the rate of 2-year Treasury Bonds (OAT); in Germany, the Bundesanleihen or Bund rate at 2 years; in the United Kingdom, the "Gilts" rate at 2 years ; Trend is the daily trend of time with the 01/01/2004 date defined as 1.

Companies financed by Buyout funds show an increased preference for IPOs after high returns and when the rate of treasury bills is high. The evolution of macroeconomic growth indicators favors IPOs when growth is high compared to the recent past. They tend more towards acquisitions when the P/E ratio is high because the relationship between the probability of an IPO and the P/E ratio variation is negative and statistically significant at the 1% level. The result of the change in the P/E ratio is not expected, given the results of the cross-sectional regression that indicate that the issue activity is higher when the P/E ratio is rising while the acquisition activity is higher when the P/E ratio is falling.

The results of the cross-sectional regression in Table 5 indicate that the acquisition activity is higher in anticipation of a rise in market returns, unlike the case of IPOs whose activity increase is strongly related to lower returns. In reference to the results of the Probit regression, the increase in market returns in each of the two quarters preceding the exit is associated with an increase in the probability of exit via an IPO in Model A. However, there is a negative and statistically significant relation between the probability of an IPO and market returns in the two quarters following the exit. The probability of an IPO is also higher after the increase in the number of patents granted, as well as after the economic growth measured by the growth of the GFCF. The relation between the choice of an IPO and the change in price/earning ratio (P/E) is positive and statistically significant at the 1% level. The relation between the choice of an IPO and the Treasury bill rate has significant economic significance and is statistically significant at the 1% level. The relation between the consumer confidence index and the choice of exits via an IPO is positive and statistically significant. Based on these findings, it can be concluded that the results of the Probit regression provide strong support for the Market Timing hypothesis, although the determining factors of Pseudo Market Timing play a role in the choice of the exit strategy.

### 3.3.2. Country analysis (France, Germany and the United Kingdom)

In all 3 countries, the results obtained in Table 8 confirm the results obtained for the overall sample. Indeed, investment funds show an increased preference for IPOs after rising returns. This finding is reflected in positive and statistically significant returns for the two quarters preceding the IPO in the three countries.

Table 8. Probit model of choice of exit strategy: IPO vs Acquisition by country (France, Germany and United Kingdom)

VARIABLES	France		Germany		United Kingdom	
	Model A	Model B	Model A	Model B	Model A	Model B
BHRQ1	1.696*** (0.204)	6.769*** (1.590)	0.344* (0.192)	4.103*** (0.903)	3.071*** (0.714)	6.794*** (2.073)
BHRQ2	1.702*** (0.312)	6.690*** (1.461)	0.165*** (0.0200)	0.314*** (0.0811)	1.817** (0.924)	5.073** (2.328)
BHRQ3	-1.586*** (0.421)	-6.497*** (1.682)	-0.153*** (0.0209)	-0.949*** (0.193)	-0.920*** (0.0983)	-1.683*** (0.319)
BHRQ4	-0.833** (0.336)	-3.172** (1.430)	-1.406*** (0.335)	-3.920*** (0.998)	-2.209*** (0.292)	-4.567*** (0.721)
PER		0.802*** (0.229)		0.183*** (0.0707)		0.321 (0.969)
GFCF		0.0574 (0.0557)		2.482 (3.116)		0.293*** (0.0623)
Patents		0.00318 (0.0678)		0.977*** (0.214)		0.838*** (0.138)
CCI		0.365*** (0.0907)		-0.0543 (0.0708)		0.216*** (0.0399)
Bonds		0.172***		4.307***		0.665

	France		Germany		United Kingdom	
		(0.0560)		(1.308)		(1.433)
Trend	-0.00228*** (0.000487)	-0.00505** (0.00213)	0.369* (0.204)	0.517 (0.413)	-0.00239*** (0.000576)	-0.00639*** (0.00177)
Constant	0.949*** (0.270)	4.608*** (1.673)	-5.657*** (0.998)	-44.61*** (9.251)	6.166*** (0.581)	14.18*** (2.228)
Observations	1,022	1,022	728	728	1,487	1,487

Note: Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 8 presents a comparison of the results of the Probit regression whose dependent variable equal to 1 for IPO exit and 0 for acquisition between France, Germany and the United Kingdom. The Probit model is defined as follows:

$$\text{Probit (Exit)} = \alpha_1 + \alpha_2 \text{BHR (Q-2)} + \alpha_3 \text{BHR (Q-1)} + \alpha_4 \text{BHR (Q+1)} + \alpha_5 \text{BHR (Q+2)} + \alpha_6 \text{PER} + \alpha_7 \text{GFCF} + \alpha_8 \text{Patents} + \alpha_9 \text{CCI} + \alpha_{10} \text{Bonds} + \alpha_{11} \text{Trend} + \alpha_{12} \text{Log (Trend)} + \epsilon \quad (2)$$

The independent variables are the market returns measured by the Buy and Hold Returns of the MSCI United Kingdom Equal Weighted Index, MSCI Germany Equal Weighted Index, and the MSCI France Equal Weighted Index over a 60-day window knowing that BHR (Q-2) represent the market returns two quarters before the exit, BHR (Q-1) are the market returns during the quarter preceding the exit, BHR (Q + 1) are the market returns during the first quarter after the exit and BHR (Q + 2) are the market returns in the second quarter following the exit. the change in the price / earnings ratio (P / E) of the FTSE All Share (United Kingdom), CAC 40 (France) and DAX 30 (Germany); The annual growth rate of GFCF or gross fixed capital formation; The variation in the number of granted patents; The change in the consumer confidence index; 2 years treasury rates: In France, the rate of 2-year Treasury Bonds (OAT); in Germany, the Bundesanleihen or Bund rate at 2 years; in the United Kingdom, the "Gilts" rate at 2 years ; Trend is the daily trend of time with the 01/01/2004 date defined as 1.

The results of the cross-sectional regression presented in Table 6 indicate that the acquisition activity is higher in anticipation of a rise in market returns, unlike the case of IPOs whose activity increase is strongly linked to lower market returns. The results of the Probit regression support these results in the 3 countries. In fact, the choice of an exit via an IPO is negatively and significantly related to the post-IPO returns in the model (A). This significance persists in the B model of the 3 countries. From these findings, we can conclude that the relation between the choice of an exit via an IPO and market returns is a strong proof of Market Timing.

In France, the choice of an IPO is associated to the periods of strong capital demand presented by the rise in the treasury bill rates, periods of increase of the Consumers confidence index and P/E ratio. In Germany, companies looking to exit seem to opt more for IPOs when treasury bill rates are rising, the number of granted patents is increasing and the the P/E ratio is increasing. However, in the United Kingdom, the choice of an introduction is more likely during the inventive evolution, the economic growth and the increase of the consumer confidence index. Companies looking to exit seem to opt for more acquisition when the consumer confidence index is down and the market may be less able to perceive favorable opportunities for raising capital. The difference between the key factors of Pseudo Market Timing involved in the choice of the exit strategy between the 3 countries may be due to the European legal and economic competitive space.

The results obtained for the 3 countries show that the increase in the probability of exit via an IPO is associated to the increase of the market returns during two quarters preceding the exit and the decrease of the subsequent return. However, the economic and statistical significance of the relationship between the choice of an IPO and the factors determining Pseudo Market Timing, namely the variation of the P/E ratio, the growth of the GFCF, the number of granted patents, the consumer confidence index and finally the rate of treasury bills, differ from one country to another. Overall, all the evidence provides full support for Market Timing and reflects the ability of investment funds to time the market successfully and provides a moderate support for the pseudo Market Timing.

The difference between IPOs and acquisitions can be explained by many reasons. In fact, Investors resort to acquisitions as an exit strategy because of the increase in fixed costs during the market downturn. Then, if information asymmetry is greater when economic activity is weak, investors can avoid IPOs and acquisition values may be lower due to several circumstances such as a higher cost of due diligence to overcome concerns during such periods, lack of competition in the IPO market, and weak growth opportunities. Companies may opt for IPOs during periods of low economic growth because they are less interested by the growth capital and motivated primarily by their need to leave the LBO project. The choice of exit may depend on the market trend; (up and down-markets). Finally, Underwriters may avoid the introduction of a company at values that are significantly lower than the values of the latest introductions that are comparable to it, or, may be oriented towards the valuation of IPOs

based on their perceptions of values in relation to the current market value. All of these explanations are consistent with the assumptions of relative cost, capital demand, and asymmetry of information that are supported throughout our analysis

## Conclusion

The choice of investment funds to leave a company via an IPO or an acquisition is one of the important aspects of private equity investment, in particular Leverage Buyout. The considerations that favor the choice of an IPO or an acquisition are complex. The results of our study shed new light on the interpretations of Market Timing's statistical evidence in previous research on the Timing of IPOs and the choice of exit from a Buyout investment. In this paper, we examined IPO and acquisition waves, and the exit choices of 3237 Buyout-Backed over a period of 15 years (2004-2018).

In this research, we initially discussed the main factors that influence the exit choice of an LBO, namely the economic conditions and the stock market returns at the time of the exit. Then we examined directly the exit choices and we studied IPO and acquisition "waves". These different tests were carried out, first, on the global sample and then, on three countries, namely France, Germany and the United Kingdom.

Our results support partially Pseudo Market Timing's assumptions but confirm the application of Market Timing and reflect the ability of investment funds to time the market successfully. Indeed, market returns in the two quarters preceding the exit are higher than the post-exit returns in the case of IPOs as well as in the case of acquisitions. Nevertheless, post-IPO returns are negative while post-acquisition returns remain positive. The difference between post-IPO returns and post-acquisition returns is still statistically significant. Overall, the results of the IPO and acquisition wave review through the cross-sectional regression partly support Pseudo Market Timing's assumptions but provide full support for the Market Timing hypothesis. Finally, the study of exit choices using Probit regression shows that the increase in exit probability via an IPO is associated to the increase in market returns during the two quarters preceding the exit and the lower subsequent returns which support Market Timing's assumptions.

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## Analysis of the Determinants of Non-Performing Loans in Thailand: Empirical Study of the SMEs Non-Performing Loans

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### Abstract:

Non-Performing Loans or NPLs is an essential banking performance indicator and it reflected credit risk and bank's asset quality. An increasing in NPLs level leads to unstable of banking system. Therefore, several literatures examine the various aspects of NPLs.

This paper aims to investigate the determinants of the NPLs in Thailand banking system, focusing on the NPLs from SMEs. The paper was conducted by using the secondary data in the period from 2008Q1 to 2018Q4. The results found that debt ratio (DEB), loan to deposit ratio (DEP), Gross Domestic Product (GDP), domestic interest rate (INT), inflation rate (INF) and unemployment rate (UNEMP) had significant impact on total non-performing loan (NPL\_T), corporate non-performing loan (NPL\_CO), and customers non-performing loan (NPL\_CU). In addition, the research indicated that Gross Domestic Product (GDP) seems to be the most important factor that affects the total non-performing loan (NPL\_T) and corporate non-performing loan (NPL\_CO), while it is a second greatest factor influencing Customer non-performing loan (NPL\_CU).

**Keywords:** non-performing loan; SMEs; risk credit; commercial bank.

**JEL Classification:** E02; B22; B26; B41; C01; C32; C58; E00.

### Introduction

Small and medium-sized enterprises (SMEs) are one of the most important sectors in Thai economic systems. As statistic shows that, there were 2.7 million SMEs in Thailand, comprising 98.5% of total enterprises. In addition, the SMEs contribute 42.4% of the overall gross domestic product (GDP) and 80.4% of the workforce in Thailand. Likewise, Thai SMEs also contributed 28.8% of total exports and 31.9% of total imports by value in 2017 (Asian Development Bank 2018). Since the SMEs play a significant role in the Thai economy, it is important to increase their resilience. To increase their resilience, it is necessary to provide them with stable and adequate finance. Therefore, the SMEs credits, which account for 32.8% of total commercial bank loans in Thailand, is still small in scale, however the ratio of non-performing loans (NPLs) in SME lending remains high. The ratio of gross non-performing loans (NPLs) to total loan was at 2.92%, while the ratio of non-performing loans in SMEs is about 3.4% (Bank of Thailand 2018). For this reason, the issue of "Non-performing Loans" (NPLs) has become common issues in Thailand banking system, since the bank with high level of NPLs is considered as less capable in managing its credit properly (Fajar 2017).

Non-performing Loans (NPLs) refer to the loans, which are 90 days or more past dues or no longer accruing interest (International Monetary Fund 2011). The NPLs is one of banking performance indicator and it reflected credit risk and bank's asset quality. An increasing level of NPLs can lead to very serious implications. Therefore, several literatures investigate the various aspects of NPLs. For example, Wondimagegnehu (2012) focus on the



determinants of NPLs of banking industry in Ethiopia. In addition, De Bock and Demyanets (2012) employed the panel 1996-2010 in 25 emerging market countries to discover the important factors of the NPL ratios. Beck, Jakubik and Piloju (2013) examine the NPL ratio determinant by using the fixed-effect panel data regression. Vatansever and Demir (2017) detect NPLs and homogeneous credit risk groups by geographical locations Turkish Credit Market.

According to the danger of the high NPLs ratio in the economic system, it is necessary to examine the factors affecting NPLs level in financial system. However, a recent research on the problems of NPLs in Thailand was not easy to find out. Therefore, this paper aims to analyze the determinants of the NPLs in Thailand financial system, focusing on the NPLs from the SMEs. The paper was conducted by using the secondary data in the period from 2008Q1 to 2018Q4. This paper is constructed as follows: Section 2 presents the literature reviews that related to the paper. Section 3 provides research methodology. Section 4 discusses an empirical result and discussion and the conclusion are presents in section five.

## 1. Literature review

There are numerous literatures aiming to examine the determinants of the non-performing Loan (NPLs), most of these literatures focused on predicting the NPLs ratio and estimating the level of the NPLs in economic system. For example, Berge and Boye (2007) indicated the risk loans in Nordic banking system over the period 1993–2005 of 54 countries. The research found that the risk loans are determined by the real interest rates and unemployment. Similarly, Buncic and Melecky (2013) claimed that GDP growth rate, inflation and real interest rates are significant affecting NPLs ratio while Nkusu (2011) point that real GDP, unemployment rate, interest rates and housing and equity prices are important factors determining the NPL ratios of 26 advanced economies.

There had been some studies that looking at causes, consequences and the solutions to manage unexpectedly NPLs ratios. Sanjeev (2007) created a model to examine factors affecting the changes in the NPLs level in the Indian financial system by using questionnaires to the managers of the 37 Indian commercial banks. The result indicates that internal factors, such as manager's motivation, lack of workers, and lack of focus on top managers had no significant effect the NPLs, while external factors including political intervention and soft budget constraints have a highly significant influence on the NPLs level. Similarly, Louzis *et al.* (2010) worked on NPLs ratios in the banking system of Greece. The results found that the macroeconomic factors such as unemployment, GDP, and national debt had strong effects NPLs level.

Many researchers examine the resolution of the NPLs all over the world. Initially, they tried to test the relationship between macroeconomic variables such as GDP growth rate, price level and real estate prices, the bank size, and the NPLs level. For example, Hu *et al.* (2004) construct a model in order to examine factors influencing NPLs level. Moreover, Xu (2005) examine the NPLs in Thailand, Malaysia, Korea and China. Dimitrios (2016) identify the main determinants of non-performing loans in the euro-area banking system for the period 1990Q1-2015Q2 using GMM estimations. Vu and Turnell (2012) analyzed and compared causes of NPLs in four groups: banks, customers, collateral and other objective causes. He stated that if banks loosen their screening and monitoring of the loans they give to customers, the opportunities for NPLs would be increased. Nguyen (2015) worked on the specific data of Vietnam commercial banks by using ten commercial banks in Vietnam during 2005 to 2011. This research aims to identify the factors of non-performing loans in Vietnam. The result shows that both macroeconomic and bank-specific factors significant affect the rate of non-performing loans. Baholli *et al.* (2015) used econometric model to analyses analysis of factors influencing non-performing loans in banking system the Albanian economy. This paper indicated that liquidity and business performance related to risk on NPL rate for Albania financial stability. Hue (2015) investigated the determinants of Non-performing Loans (NPLs) in the Vietnam. The research found that there are four factors determinate NPLs in the Vietnam, including the lag of NPLs, Loan growth rate, Bank asset, and state-owned or not. Asfaw, Bogale, and Teame (2016). Cheng *et al.* (2016) examine the factors affecting the NPLs in Taiwan banking system. In Thailand case, some literature in NPLs in banking system such as Yoshino *et al.* (2005) using data on lending by banks to SME investigate the credit risk in Thailand.

Base on literature above, there had been little research on the factor influencing the NPL in Thailand, especially loan to SMEs. This research aims to analyze non-performing loan in Thailand financial system, and examine the determinant of analyze non-performing loan in Thailand, focusing on the SME's NPLs.

## 2. Methodology

### 2.1. Research model

This paper analyses factors affecting non-performing loan in Thailand through econometric modelling. Many researchers have used different econometric model for explaining the NPL level. For example, Kalirai and Scheicher (2002) used the simple linear regression model to explain the change in NPLs level in Austria for during 1990 to 2001. Virolainen (2004), Hue (2015), and Cheng *et al.* (2016) indicated that economic growth is very important factors for the NPLs level. Another factor that explains NPL rate is considered inflation. In addition, loans interest rate is also significant impact to NPLs. Taking literature above, this research will test the factor affecting SMEs NPLs from following model:

$$NPL_T = \alpha_1 + \beta_1 DEP + \beta_2 DEB + \beta_3 GDP + \beta_4 INT + \beta_5 INF + \beta_6 UNEM \quad (1)$$

$$NPL_{CO} = \alpha_1 + \beta_1 DEP + \beta_2 DEB + \beta_3 GDP + \beta_4 INT + \beta_5 INF + \beta_6 UNEM \quad (2)$$

$$NPL_{CU} = \alpha_1 + \beta_1 DEP + \beta_2 DEB + \beta_3 GDP + \beta_4 INT + \beta_5 INF + \beta_6 UNEM \quad (3)$$

NPL is Non-Performing Loans Ratio (NPL). The NPL in this research is defined as the ratio of the principal and interest of loans not paid in a certain period to the total loans. There are three Non-Performing Loans Ratio that including in this paper: NPL\_T is total non-performing loans ratio in the commercial banking system:

$$NPL_T = \frac{\text{Total Non-Performing Loan by the SMEs}}{\text{Total Loan to the SMEs}} \quad (4)$$

NPL\_CO is non-performing loans ratio in the commercial banking system by corporates:

$$NPL_{CO} = \frac{\text{Non-Performing Loan by Corperate}}{\text{Total Loan to the SMEs}} \quad (5)$$

NPL\_CU is non-performing loans ratio in the commercial banking system by customers:

$$NPL_{CU} = \frac{\text{Non-Performing Loan by customers}}{\text{Total Loan to the SMEs}} \quad (6)$$

DEP refers to loan to deposit ratio. The DEP use for measuring the usage efficiency deposit funds. The higher loan to deposits ratio, the greater the total loans and the higher the NPLs ratio in banking system. Based on "The Moral hypothesis," Lee and Ho (2007) considered that if loans were too readily available in the financial system, financial institutions would absorb these excess funds as quickly as possible. When the banks examined loans, the credit information system was not often correct, and this caused the deterioration of loan quality and the banks credit risk. The DEP in this research measuring by total loan to total deposit in commercial banking system:

$$DEP = \frac{\text{Total Loan}}{\text{Total Deposit}} \quad (7)$$

DEB is a debt ratio. The DEB is defined as a relationship between total debts and total assets of the commercial banking system, which is an important indicator to measure a company's capital structure. When debt is too high, the advantage will enable increased risk. For that reason, this indicator is considered a measure of long-term solvency in banks. Lu *et al.* (2005) found that debt ratio and the NPL ratio had a significantly positive correlation and proved that the higher the debt ratio, the higher in the non-performing loans ratio. This paper uses the following equation for debt ratio:

$$DEB = \frac{\text{Total Debt}}{\text{Total Asset}} \quad (8)$$

GDP is Gross Domestic Product. The Growth GDP growth rate (the annual percentage growth of GDP at constant) prices are used in this model. INF is an inflation rate. The INF in this paper is measured by Consumer Price Index for all goods and services. INT is domestic interest rate. This research will adopt the Minimum Loan Rate as a proxy of the domestic interest rate. UNEM is unemployment rate in Thailand.

This paper analyzes the non-performing loan in banking system and examines the determinant of non-performing loan in Thailand, focusing on the SME's NPLs. The paper is conducted by using secondary quarterly data sets, data from 1980Q1 to 2018Q4. To achieve the results of factors influencing the NPLs by SMEs in Thailand banking system, this research is first applying the Augmented Dickey-Fuller test (ADF) to test the stationary of each variable and establish the order of integration of variables used in model. Many economists claim that there might be cointegration in a set of two or more variables. After that, cointegration testing was applied. The pair-wise

cointegration is applied as a pre-test in this section in order to test whether there is pair-wise cointegrating between the variables. After that, the multivariate cointegration approach and the Vector Error Correction Model are applied to examine the long run and the short-run relationship of the determinant in NPLs in Thailand.

### 3. Empirical results and discussion

#### 3.1. The result of Unit Root Testing

Since using stationary data is an important condition for analyzing time series data, therefore, the first step of this paper is detecting for stationary data of variables that included in the models. The Augmented Dickey-Fuller (ADF) (1979) was applied to detected unit root. The results of ADF unit root are presents in table, where the numbers in table presents the ADF statistic, both at level and 1<sup>st</sup> difference. The results of unit root were conducted by comparing the ADF statistic with a MacKinnon critical value, If the ADF statistic is greater than the MacKinnon critical value, the null hypothesis of unit root is rejected, and it can be said that the variable is stationary.

Table 1 presents the results of ADF unit root. At level, the results states that null hypothesis of unit root are not reject for most of variable included in the model, except loan to deposit ratio (DEP), debt ratio (DEB) and unemployment rate (UNEMP). These can be said that most variables are non-stationary at level. However, at the first difference of time series, the ADF statistics shows that the null hypotheses of unit roots are rejected at 1% significant for every variable (NPL\_T, NPL\_CO, NPL\_CU, DEP, DEB, GDP, INT, INF, and UNEMP) since the ADF statistic are greater than the critical values. These means every variable that included in the model are stationary or integrated at order 1 (I (1)). Therefore, all variables are stationary first difference and can be used in time series analysis.

Table 1. Results of Unit root test in NPLs model

Variables	At level		At first difference	
	ADF Statistic	Prob	ADF Statistic	Prob
NPL_T	-2.429 (0)	0.140	-9.310 (0)*	0.000
NPL_CO	-2.697 (0)	0.083	-9.905 (0)*	0.000
NPL_CU	-2.080 (0)	0.253	-10.548 (0)*	0.000
DEP	-5.226 (0)*	0.007	-9.670 (0)*	0.000
DEB	-4.770 (0)*	0.000	-7.209 (0)*	0.000
GDP	-0.037 (0)	0.948	-8.841 (0)*	0.000
INT	-1.763 (0)	0.393	-8.921 (0)*	0.000
INF	-1.560 (0)	0.493	-6.009 (0)*	0.000
UNEMP	-6.434 (0)*	0.000	-7.380 (0)*	0.000

Note: \* indicate the significance level at 1%; The number in ( ) indicates the optimum lag-length of ADF

#### 3.2. Empirical Result of Long – Run NPLs function

This paper applied Johansen cointegration for analyses the cointegration among variables that included in Long – Run NPLs Function. The results of Johansen cointegration present in Table 2- 4. Table 2 indicates the estimation of Johansen cointegration for total non-performing loans function (NPL\_T). The result presents that the trace statistic of at most 4 equal 38.268, which is greater than the 5% critical value (35.192). This can be concluded that there is the five integrating vector in total non-performing loans function.

Table 2. Johansen Cointegration for total non-performing loans function

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical value	Prob.**
None *	0.897	272.943	134.678	0.000
At most 1 *	0.790	179.634	103.847	0.000
At most 2 *	0.693	115.564	76.972	0.000
At most 3 *	0.504	67.071	54.079	0.002
At most 4 *	0.370	38.268	35.192	0.022
At most 5	0.273	19.310	20.261	0.067
At most 6	0.140	6.227	9.164	0.173

Note: Trace test indicates 5 cointegrating eqn(s) at the 0.05 level; \* denotes rejection of the hypothesis at the 0.05 level; \*\*MacKinnon-Haug-Michelis (1999) p-values.

The results achieved from the cointegration test of customer non-performing loans function (NPL\_CU) presents in table 3. The results states that the trace statistic test of null hypothesis of there is at least r cointegrating vector against the alternative of cointegrating vector. The result found that the statistic of at most three equal 48.056,

which greater than 95% critical value (47.856). This can be said that there is the existence of four cointegrating vector in long run customer non-performing loans function

Table 3. Johansen Cointegration for customer non-performing loans function\

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.794	199.126	125.615	0.000
At most 1 *	0.748	134.259	95.753	0.000
At most 2 *	0.514	77.660	69.818	0.010
At most 3 *	0.433	48.056	47.856	0.047
At most 4	0.293	24.776	29.797	0.169
At most 5	0.213	10.541	15.494	0.241
At most 6	0.017	0.7130	3.841	0.398

Note: Trace test indicates 4 cointegrating eqn(s) at the 0.05 level; \* denotes rejection of the hypothesis at the 0.05 level; \*\*MacKinnon-Haug-Michelis (1999) p-values

Table 4 provides the result of Johansen cointegration for long run corporate non-performing loans function. The null hypothesis of there is at most five cointegrating vector against the alternative of more than  $r$  combination in corporate non-performing loans. The statistic presents that the null hypothesis of at most 5 can be rejected at 5% significant level because the trace statistic is greater than critical value at 95%. This means that there exists 6 cointegrating vector in corporate non-performing loans.

Table 4 Johansen Cointegration for cooperate non-performing loans function

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.786	200.569	134.678	0.000
At most 1 *	0.707	137.252	103.847	0.000
At most 2 *	0.495	86.817	76.972	0.007
At most 3 *	0.423	58.797	54.079	0.017
At most 4 *	0.313	36.211	35.192	0.038
At most 5 *	0.295	20.786	20.261	0.042
At most 6	0.144	6.416	9.164	0.160

Note: Trace test indicates 6 cointegrating eqn(s) at the 0.05 level; \* denotes rejection of the hypothesis at the 0.05 level; \*\*MacKinnon-Haug-Michelis (1999) p-values

The result of normalize cointegration vector of the non-performing loans function presents in Table 5. The number in the table shows coefficient and t-statistic of the long run relationship among the variables. The results is performed by setting the estimated coefficient on non-performing loans function equal -1 and dividing each cointegrating vectors by the negative of relevant coefficient, then the vectors can represent the long run non-performing loans function.

As can be seen in the table, all variables, including that debt ratio (DEB), loan to deposit ratio (DEP), Gross Domestic Product (GDP), domestic interest rate (INT), inflation rate (INF) and unemployment rate (UNEMP) has significant impact on total non-performing loan (NPL\_T), corporate non-performing loan (NPL\_CO), and customers non-performing loan (NPL\_CU).

Total non-performing loan (NPL\_T), the results states that debt ratio (DEB), inflation rate (INF), and unemployment rate (UNEMP) has positive effect total non-performing loan (NPL\_T), while loan to deposit ratio (DEP), Gross Domestic Product (GDP) and domestic interest rate (INT) influencing total non-performing loan (NPL\_T) negatively. The GDP has strongest effect on the NPL\_T since the coefficient it the greatest. The coefficient of GDP is -10.326, means that 1% dropped in GDP leads to 10.321 percent increase in NPL\_T. DEP and INT have similarly impact the NPL\_T. The coefficient of DEP and INT are -4.965 and -4.447. This can be said that 1 percent decrease in DEP leads to -4.965% rise in NPL\_T. The unemployment rate seems to have smallest effect on the NPL\_T. If the unemployment rate increases by 1%, the NPL\_T will be increased by 0.222 %.

Corporate non-performing loan (NPL\_CO), the results in Table 5 indicate that loan to deposit ratio (DEP), and unemployment rate (UNEMP) has positive impact on Corporate non-performing loan (NPL\_CO). However, debt ratio (DEB), Gross Domestic Product (GDP) and inflation rate (INF) have negative influencing Corporate non-performing loan (NPL\_CO). The coefficient of DEP is -18.327, interpreting that 1% reduced in loan to deposit ratio cause Corporate non-performing loan (NPL\_CO) reduce by 18.327%. While the loan to deposit ratio is the greatest impact on corporate non-performing loan, the unemployment rate is the weakest impact on corporate non-

performing loan (NPL\_CO). The coefficient of unemployment rate is 0.218. this can be said that 1% increase in unemployment rate lead to 0.218 percent decrease in corporate non-performing loan.

Customer non-performing loan (NPL\_CU), the results in Table 5 found that deposit ratio (DEP), Gross Domestic Product (GDP), Domestic Interest Rate (INT) have negative influencing Customer non-performing loan (NPL\_CU). However, debt ratio (DEB), inflation rate (INF) and unemployment rate (UNEMP) affecting Customer non-performing loan (NPL\_CU) positively. The INF is greatest impacts on customer non-performing loan, with coefficient are 19.479. If the inflation rate increases 1%, the customer non-performing loan will be increase by 19.479%.

Overall of long run non-performing loans function, Gross Domestic Product (GDP) seems to be the most important factor that effect the Total non-performing loan (NPL\_T) and Corporate non-performing loan (NPL\_CO), while it is a second greatest factor influencing Customer non-performing loan (NPL\_CU). Since the GDP represent the economics, growth and it also affect business performance. Higher GDP growth rate, more likely increase business profitability, and ability to pay back to debt will be improved. This can reduce the non-performing loan (NPL\_T) in the banking system. This result similarly to Baholli (2015), that claims that business performance is depend on economic growth and it finally affect the NPLs.

Table 5. Normalize cointegration vector of the non-performing loans function

Variables	NPL_T		NPL_CO		NPL_CU	
	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic
DEP	-4.965*	-5.315	2.403*	2.567	-7.066*	-6.891
DEB	3.505*	2.505	-18.327*	-12.77	7.110*	10.528
GDP	-10.326*	10.133	-14.531*	-16.396	-6.814*	-10.436
INT	-4.447*	-3.368	-0.982*	-9.391	-5.560*	-7.500
INF	4.122*	2.121	-0.982*	-9.391	19.479*	17.892
UNEMP	0.222*	4.188	0.218*	3.516	0.327*	11.198

Note: \* indicate the significance level at 5%

*The short run of real effective non-performing loans function determinant*

While the previous section presents the long of non-performing loans function determinant in using the co integration approach, this section shows a short run dynamic relationship of the set of variables in non-performing loans function by using the Vector Error Correction Model.

The results of short run non-performing loans function determinant by eliminating an insignificant lagged variable from the system based on t-statistic. The equation for non-performing loans function estimated by ECM present as following:

Taking  $\Delta(NPL_T)$  as dependent variables, the coefficient of ECT (-1) is -0.088. Since the error, correction terms represent speed adjustment to the long-run equilibrium of Total Non-performing loans function. It can be said that the disequilibrium of Total Non-performing loans function in Thailand will be corrected approximately 8.8 percent in a quarter. In addition, the results also indicate that the change in the NPL\_T in second last quarter, gross domestic product in second last quarter, interest rate in the lase and second last quarter has positive effect total Non-performing loans function in the short run. However, inflation rate in the second last quarter affect total Non-performing loans negatively in the short run.

The coefficient of  $\Delta NPL_{t-2}$  is 0.718 suggesting that if the non-performing loans in last two quarter increased by 1%, total non-performing loans. The equation of total non-performing loans can be written as following:

*Total Non-performing loans function*

$$\Delta NPL_T = -0.088ECT_{t-1} + 0.718\Delta NPL_{T,t-2} + 1.118\Delta GDP_{t-2} + 0.317\Delta INT_{t-1} + 0.356\Delta INT_{t-2} - 1.198\Delta INF_{t-2} \quad (9)$$

(-2.188)
(4.137)
(1.99)
(4.254)
(-2.48)

R-square = 0.798

Adjust R -square = 0.671

SEE = 0.126

Sum sq residues = 0.382

Log likelihood = 36.237

F-statistic = 6.326

*Corporate non-performing loan (NPL\_CO)*

The coefficient of ECT (-1) equal -0.183, meaning that disequilibrium of corporate non-performing loan (NPL\_CO) will be corrected by 18.3% within a quarter. The coefficient of  $\Delta DEB$  (-2) is 14.06, which are significant

at 1%. This implies that 1% increase in a debt ratio past two quarters led to an increase in current corporate non-performing loan (NPL\_CO) 14.06%. The equation of corporate non-performing loans can be written as following:

$$\Delta NPL\_CO = -0.183ECT_{t-1} + 14.06\Delta DEB\_T_{t-2} - 3.047\Delta GDP_{t-1} \quad (10)$$

(-2.80)                      (2.049)                      (-2.042)

R-square = 0.965

Adjust R -square = 0.944

SEE = 0.221

Sum sq residues = 1.177

Log likelihood = 13.744

F-statistic = 45.073

#### *Consumer non-performing loans function*

Setting Consumer non-performing loans (NPL\_CU) as a dependent variable, the results found that the error correction term is 1% significant, suggested by the t-statistic being -3.443, greater than 1% critical value for the t-statistic (2.57). The coefficient of ECT (-1) for Consumer non-performing loans (NPL\_CU) is -0.541, meaning that the disequilibrium of the Consumer non-performing loans (NPL\_CU in Thailand will be corrected approximately 54.1% within a quarter. It interesting that changes of lag for Consumer non-performing loans (NPL\_CU) are insignificant at 5%. The equation of Consumer non-performing loans can be written as following:

$$\Delta NPL\_CU = -0.541ECT_{t-1} - 0.616\Delta NPL\_T_{t-1} + 0.885\Delta INT_{t-1} \quad (11)$$

(-3.443)                      (-2.074)                      (3.692)

R-square = 801

Adjust R -square = 0.677

SEE = 0.255

Sum sq residues = 1.571

Log likelihood = 7.984

F-statistic = 6.46

## **Conclusion**

Non-performing Loans (NPLs) is the loans that are 90 days or more past dues or no longer accruing interest. The NPLs usually considered as one of banking performance indicator and it reflected credit risk and bank's asset quality. An increasing level of NPLs can lead to very serious implications. Therefore, several literatures investigate the various aspects of Non-Performing Loans. Therefore, several literatures examine the various aspects of NPLs. The purpose on this paper was to investigate the determinants of the NPLs in Thailand banking system. This paper was identified macro variables that can affect the credit risk and the small and medium enterprise's NPLs. Three types of NPL were applied in this paper: total non-performing loan (NPL\_T), corporate non-performing loan (NPL\_CO), and customers non-performing loan (NPL\_CU). The paper was conducted by using the secondary data in the period from 2008Q1 to 2018Q4. The results found that debt ratio (DEB), loan to deposit ratio (DEP), Gross Domestic Product (GDP), domestic interest rate (INT), inflation rate (INF) and unemployment rate (UNEMP) has significant impact on total non-performing loan (NPL\_T). In addition, the research indicated that Gross Domestic Product (GDP) seems to be the most important factor that affects the total non-performing loan (NPL\_T) and corporate non-performing loan (NPL\_CO), while it is a second greatest factor influencing Customer non-performing loan (NPL\_CU).

According to the results, banks should pay more attention to many variables when offering customers loans in order to reduce the level of non-performing loans. Principally, banks or other financial institutions should consider the economics condition such as economic growth and unemployment level because if better economics condition leads to grater business performance and lower credit risk, then the customer will be able to repay debt.

For future research, we could use other macroeconomic variables such as real exchange rate and monetary policy, and other specific bank variables (such as bank size or liquidity). In addition, other econometric methods such as dynamic panel incorporating the lagged non-performing loans among the explanatory variables should be considered.

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## Arbitrage Profits in Thai Warrants

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### Abstract:

This study analyzed the data of 90 warrants traded on the Stock Exchange of Thailand from January, 2013 to March, 2018 for arbitrage profits. The findings revealed the opportunity for arbitrage profits at 4.20% with a mean arbitrage profit of 10.029 Baht. The maximum arbitrage profit was 60.92 Baht and the minimum arbitrage profit was 0.072 Baht.

**Keywords:** arbitrage profits; warrants; trading strategy; investment.

**JEL Classification:** G11; G14.

### Introduction

Arbitrage profit means the opportunity for free money or, literally, certain profit with no risk. According the official definition, "arbitrage profit" means the opportunity to create an investment portfolio capable of generating cash flow valued at no less than zero at any given time. Type A Arbitrage means a situation where investors can profit immediately at no future cost while Type B Arbitrage means an investment situation with non-positive costs and opportunity to receive higher returns than zero and no opportunity for returns at less than zero.

The aforementioned profit-making strategy is called "arbitrage strategy". Ordinarily, opportunities for arbitrage profit come from accurate information. Increased communication and competition in the market reduce the aforementioned opportunities for profit. Normally, when setting prices for financial products, we assume there are no arbitrage opportunities. In addition, if the aforementioned opportunities occur, investors will buy and sell as they push for prices to be appropriate. However, the aforementioned assumptions may not be true in practice and some fund managers may focus on seeking profit and using the arbitrage profit strategy.

Warrants are derivatives with the same characteristics as call options. Prices warrants and underlying stock must be relative to theory. Otherwise, arbitrage profit opportunities may be created. This study is aimed at determining whether there is opportunity for arbitrage profit from investments in warrants.

### 1. Literature review

Warrant Studies involving arbitrage profits have been conducted on the topic of arbitrage profit in financial instruments, particularly concerning the prices of common shares and warrants.

Sathayanukarn (2009) studied arbitrage profit due to fluctuations in the prices of common shares and warrants with the aim of studying warrant valuation concepts, rates of return from inconsistencies between the prices of common shares and warrants, and arbitrage profit opportunities by collecting data on the daily prices of common shares and warrants. According to the aforementioned study, when warrants were combined with prices and fees valued lower than common share prices, investors can generate returns from the difference between both securities' prices. In cases where rates of returns are positive and have a higher cost than the cost of borrowing common shares, investors can earn arbitrage profit by borrowing common shares from minor investors or securities companies to sell with warrants, holding warrants until common shares have expired to convert rights into common shares and using common shares to repay borrowed shares. According to observations and data collection over a 236-day period, both types of securities were found to have abnormal prices at several consecutive times in the period of 60 days before warrants are expired. Investors were able to make arbitrage profit for 29 days.

In terms of studies on arbitrage profit from futures contracts, Sathayanukarn (2009) conducted a study and research on the topic of Opportunity & Profitability of SET Index Futures and found incomplete marketing opportunities and profitability from futures contracts to need to use the Reverse Cash and Carry strategy, because

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most fluctuations are lower bound when compared to theoretical prices. Furthermore, selection of underlying assets in arbitrage was found to be important. In the area of the size of fluctuations from theoretical prices, factors in the area of underlying assets selected for arbitrage to be more significant main factors than dividend payouts. In a complete market, different arbitrage opportunities and size fluctuations were found in each contract. According to the study, fluctuations of futures contract price indices were found to have convergent characteristics (x axis) when contract periods were near expiration. After solving autocorrelations by the GLS method, R-square was at 12.25% and T-statistics were found to be at 3.4857 with a significance of 0.01. This indicated contract periods to be correlated with fluctuation sizes with statistical significance at a reliability of 99%. This may be because of uncertainties which arbitrageurs were unable to anticipate, such as uncertainty of dividend payouts. Uncertainty of interest without risk or "mark to market" will cause buyers and sellers to exercise caution to maintain collateral levels at no less than the maintenance margin, thereby causing convergence with these characteristics.

Jongadsayakul (2017) conducted a study with the objective of testing the effectiveness of SET50 Index Options with a focus on differences between price correlations of SET50 Index Call Options and price correlations of the SET50 Index Put Options from using Call & Put Spreads and Call & Put Butterfly Spread conditions. Even in cases where the costs of SET50 Index Options transactions were mispriced with arbitrage opportunities, opportunities were lower than 11%. Moreover, when transaction costs, such as fees related to buying and selling, buying and selling of agent commissioning fees and loss of opportunity from placing collateral, were considered, arbitrage opportunities were lower than 5%. When bids and offers were used in place of closing prices, investors were found to be able to make arbitrage profits from buying and selling only SET50 Index Put Options. When arbitrage put spread opportunities were created, more profit was made than call spread. Additionally, when transaction costs were considered, arbitrage opportunities in every case were almost non-existent. Therefore, SET50 Index Options can be summarized as effective.

Bamberg and Roder (1994) studied profitability in DAX-Futures for institutional investors in Germany by calculating profit and transaction costs. The data used in the study were obtained by the minute to determine whether arbitrage was dependent on short sells. Most price deviations were found to be under the framework of arbitrage bands. The strategies used in arbitrage were the Reverse Cash and Carry strategy and the Short Sell strategy.

Richie, Daigler and Gleason (2007) studied arbitrage between futures and ETFs in a test of correlations between spot prices and futures prices by using SPDR and the S&P500 index as reference goods. Data used in this study was obtained by the minute to answer questions regarding arbitrage opportunities and tests to determine the duration of price fluctuations. According to tests, most price fluctuations when correlations of SPDR and S&P 500 Futures were used had negative mispricing. Furthermore, when transaction costs were higher, mean arbitrage time was found to be shorter.

Lee (2005) studied arbitrage between KOPSI200 and KOPSI 200 Futures by determining price correlations and testing arbitrage ability from price fluctuation, arbitrage frequency and profit reduction until markets stabilize or do not motivate arbitrage by using data by the minute. The KOPSI200 Futures market continued to be an ineffective market with opportunity for arbitrage. However, because of short sell limits and high costs, the KOPSI 200 Futures market does not have appropriate indices for arbitrage by the Reverse Cash and Carry method.

Ackert and Tian (1999) studied price fluctuations in the Index Options Market by testing the effectiveness of S&P 500 Index Options by using the Pricing Relationship theory under no-arbitrage conditions. The findings revealed no significant effectiveness between Options and Index markets and Put-Call Parity occurred after considering commission costs and short sales limitations. Furthermore, the findings indicated the movements of liquidity and index prices to be major factors in determining dollar violation size of price relationships. SPDRs acting as stock baskets can improve correlations between common shares and index options markets or support the hypothesis that options market efficiency will gradually improve from having SPDRs. Although there was trading in the stock basket, however, arbitrage was limited by other barriers, such as transaction costs and short sales limitations.

Using the Hong Kong index futures and index options, Bae, Chan and Cheung (1998) investigated the profitability of stock index futures based on transaction price data and found the percentage of observations violating no-arbitrage bounds was significantly reduced when bid-ask quotes were employed instead of transaction prices.

Andreou and Pierides (2004) studied and considered the effectiveness of the Athens Derivatives Exchange (ADEX) by selecting FTSE/ASE-20 Index Options to test the accuracy of Put-Call Parity, using statistical tests and considering many market limitations. The findings led to a conclusion that FTSE/ASE-20 Index Options presented arbitrage models for low-cost investors in Greek financial markets and benefited investors due to significantly low

transaction costs. However, according to tests, investors were found to have arbitrage opportunities in the first 2-3 months of operations due to lack of market efficiency. Nevertheless, the market will gradually gain efficiency until no arbitrage profit can be made.

Capelle-Blancard and Chaudhury (2001) tested efficiency of the CAC 40 Index Options market and found few violations of the correlation between Call & Put Spreads and Call & Put Convexities at no more than three percent. In addition, when transaction costs, such as differences between bids and offers, exchange fees, agent commissioning costs and conditions for borrowing shares to sell, were considered, violations of price correlations were found to be almost non-existent, confirming efficiency in the Options market.

Byoun and Park (2009) considered the efficiency of the Korea Stock Price Index 200 Options market and found the market to be effective when only options were considered. Violations of correlations between Call & Put Spreads and Call & Put Convexities were at no more than one percent. This indicated that the flow of information between the Options market and the underlying goods market may not be consistent and effective. Cheung and Printant (2019) studied divergence of Australian money market and found that once asset-specific funding costs are taken into account, short-term money market trades would have generally not been profitable for the major banks. Moreover, since 2008, the incentive for banks to arbitrage has decreased.

## 2. Data used in the study

The present study analyzed the data of warrants were bought and sold on the Stock Exchange of Thailand from January 2013 to March 2018. Daily closing price data of warrants and common shares of companies issuing warrants came from Datasteam. Data on warrant prices, rates and dates came from the Stock Exchange of Thailand ([www.set.or.th](http://www.set.or.th)). The number of unexpired warrants in January 2013 to March 2018 was 90 warrants.

## 3. Testing of arbitrage profit in warrants

According to the Lower Bound Theory of American Call Option:

$$C_0 \geq \text{Max}[S_0 - X, 0] \quad (1)$$

where: C = American Call Option Price; S = Price of Underlying Assets; X = Exercise Price.

If American Call Option prices are lower than Lower Bound, there will be arbitrage profit. This study applied this relationship with warrants to test and determine if warrant prices are lower than Lower Bound on the date when warrant rights can be exercised along with determining if there will be arbitrage profit when warrants are sold at lower prices than Lower Bound.

Figure 1 shows CHO-W1 information. CHO-W1 was a warrant for rights to buy ordinary shares of Cho Thavee Dollasien Public Company Limited, Phase 1, issued by Cho Thavee Dollasien Public Company Limited (CHO). CHO-W1 was a warrant given to CHO shareholders without calculating values. CHO-W1 warrants had a period of three years (28<sup>th</sup> October 2013 to 27<sup>th</sup> October 2016). The rate for exercising rights to buy common shares was that one warrant unit can be used to buy one common share at the exercise price of 0.5 Baht. Warrant holders were able to begin exercising rights after one year from the date of warrant issuance. Warrant holders were able to exercise warrant rights on every final business day of every quarter (March, June, September and December). If the final business day of the quarter was a holiday, the date was moved to the date before that date, except for the final date, which was the warrant's expiration date. Rights could be exercised for a total of eight times throughout the warrant period. The first date for exercising rights was 30 December 2014 and the final date for exercising rights was 27 October 2016. When stating intentions to buy common shares each time, warrant holders must state their intention to exercise rights to buy common shares in warrants in the period from 9:00 a.m. to 3:30 p.m. on every business day of the company within five business days before each specified date for exercising rights.

Because warrant holders must state the intention to exercise rights to buy common shares in warrants within five business days before each specified date for exercising rights (within fifteen days before the final date for exercising rights), Table 1 shows the closing price of CHO and CHO-W1 shares for one business day before each specified date for exercising rights and examined to determine if warrant prices were lower than Lower Bound and the amount of arbitrage profit if warrant prices are lower.

Assumptions used in this study are as follows:

- We could buy or sell CHO and CHO-W1 shares at the closing price;
- No fees were collected for share buying and selling, share borrowing fees and taxes;
- CHO (short sales) could be borrowed to sell beforehand.

When data on closing price of CHO and CHO-W1 on 26 December 2014 were considered, Lower Bound of CHO-W1 were found to be equal to  $\text{Max} [\text{CHO} - X, 0]$ , which was equal to  $\text{Max} [4.96 - 0.5, 0] = \text{Max} [4.46, 0] = 4.46$  Baht while CHO-W1 closing price on that day was at 4.04 Baht. This was lower than Lower Bound by 0.42 Baht, which needs arbitrage profit.

Figure 1. CHO-W1 Information

<b>CTV DOLL</b>		Cho Thavee Dollasien Public Company Limited
<b>7.3 Issuance of other Securities</b>		
1. Information relating to the issuance and allocation of the warrants to conversion of common stock share		
<u>Type of Securities</u>	:	Warrants for rights to purchase ordinary shares of Cho Thavee Dollasien Public Company Limited, Phase 1 ("Warrant" or "CHO-W1")
<u>Type of Warrants</u>	:	Namely and transferable
<u>Listing Date</u>	:	As of November 20, 2013 (Trading commencement on November 20, 2013)
<u>Secondary Market</u>	:	The Market for Alternative Investment (MAI)
<u>Number of Issuing Warrants</u>	:	360,000,000 units
<u>Offering Price</u>	:	0.00 THB (zero THB) Offer to the existing shareholder by the ratio of 2 existing ordinary share per 1 units of the warrant for free.
<u>Number of offering securities</u>	:	359,899,980 units
<u>Underlying Shares</u>	:	359,899,980 shares (par value THB 0.25 each)
<u>Distribution of Warrants</u>	:	As of October 28, 2013
<u>Term of Warrants</u>	:	3 years from the date of issuance and offering of Warrants
<u>Date of Maturity</u>	:	On October 27, 2016, Last Exercise Date is on October 27, 2016 and warrants will be delisted on the next day.)
<u>Rights of Warrants</u>	:	<u>Exercise Ratio</u> 1 unit of warrant has the right to purchase 1 unit of ordinary share <u>Exercise Price</u> THB 0.50 (Fifty Satang) per one unit of newly issued ordinary share Exercise ratio and exercise price subject to change as per right adjustment conditions (Please see the detail of terms and duties of right at Company website or SET. website)
<u>Term of Exercise</u>	:	First exercise date on December 30, 2014 and next exercise date on the last working day of quarter, until the last exercise date on October 27, 2016

Table 1. Closing price of CHO and CHO-W1 and amount of arbitrage profits

Date	CHO-W1	CHO	Lower Bound	Arbitrage Profit
26-Dec-14	4.04	4.96	4.46	0.42
27-Mar-15	2.50	3.18	2.68	0.18
26-Jun-15	3.34	3.96	3.46	0.12
28-Sep-15	2.60	3.24	2.74	0.14
28-Dec-15	1.41	1.91	1.41	0.00
29-Mar-16	1.64	2.22	1.72	0.08
29-Jun-16	1.96	2.32	1.82	0.00

Table 2 shows the steps for making arbitrage profit.

Table 2. Steps for making arbitrage profit in CHO-W1

Date	Transaction	Cash Flow (Baht)
26 <sup>th</sup> December 2014, Friday	CHO-W1 bought at the closing price of 4.04 Baht. CHO shares were borrowed or CHO shares in the portfolio were sold at the closing price of 4.96 Baht.	
30 <sup>rd</sup> December 2014, Tuesday	At 9:00 a.m. to 3:30 p.m., the researcher stated the intention to exercise rights to buy common shares according to warrants.	
22/03/2004, Monday		
	Payment made from CHO-W1 purchases.	-4.04

Date	Transaction	Cash Flow (Baht)
Share Price accepted and paid 3 Business Days after transaction 2 <sup>nd</sup> January 2015, Friday	CHO Payment received from short sales.	+4.96
	CHO Payment made from exercising share purchasing rights.	-0.50
Approximately 2 Weeks	The company transferred CHO shares into the portfolio and was able to redeem shares to close short sale status.	
Arbitrage Profit		0.42

The first day when warrant holders were able to exercise rights can be seen to be 30<sup>rd</sup> December 2014. Investors were able to make arbitrage profit at 0.42 Baht. According to Table xx, CHO-W1 warrant holders were found to be able to exercise rights throughout the warrant period for a total of eight times. On these eight occasions, CHO-W1 warrants were sold at lower prices than Lower Bound for xx times and was able to generate arbitrage profit from 0.08 Baht to 0.42 Baht.

#### 4. Research findings

Table 3 displays the findings on arbitrage profit in warrants traded on the Stock Exchange of Thailand from January 2013 to March 2018. A total of 90 warrants were unexpired warrants or warrants due to expire in January 2013 to March 2018 and warrants rights could be exercised 547 times. Of these 547 times, warrants were sold at lower prices than Lower Bound and generated arbitrage profit 23 times or 4.20% with a mean arbitrage profit of 10.029 Baht. The maximum arbitrage profit was 60.92 Baht and the minimum arbitrage profit was 0.072 Baht.

Table 3. Summary of arbitrage profits in warrants

Numbers of warrants studied	90
Total numbers of exercising times	547
Total numbers of arbitrage opportunities	23
Maximum arbitrage profit	60.9195
Minimum arbitrage profit	0.0715
Median arbitrage profit	5.4135
Mean arbitrage profit	10.0293

#### Conclusion

According to the findings, the arbitrage profit opportunities in warrants occurred at 4.2% and a total of 90 warrants were found to be unexpired in January, 2013 to March, 2018 with 547 opportunities for exercising rights. Of these opportunities, warrant prices were lower than Lower Bound for 23 times with arbitrage profit, while the mean arbitrage profit was 10.029 Baht. The maximum arbitrage profit was 60.92 Baht and the minimum arbitrage profit was 0.072 Baht. Although arbitrage profit opportunities were infrequent, opportunities did occur. Therefore, when warrant prices were lower than Lower Bound, investors or major shareholders in companies issuing warrants had opportunities to make arbitrage profits.

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## Drivers of Equity as a Performance Measure. A Dynamic Panel Data Analysis for Russian Firms

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### Abstract:

The purpose of this study is to find whether equity can be a performance indicator, since it is usually considered mostly as an input by investors and other interested parties. The study using empirical data tests the dynamics of equity for 201 unlisted Russian firms for the 2000 to 2015 period. A dynamic panel data analysis using GMM as proposed in Arellano and Bond (1991) is performed. The study finds that equity evolution is affected by lagged itself. The general adjustment process was quite slowly and results were affected by 2008 financial crisis. Some industries were closer to the target equity financing than others. Also, the firms' characteristics are confirmed to be drivers of equity financing. The study provides empirical results which can be used for methodological purpose, as well as for managers/specialists in view of improving and adjusting company financing policies.

**Keywords:** equity financing; dynamic panel data; performance indicators; financial crisis.

**JEL Classification:** G30; G32.

### Introduction

Equity is a complex concept and measure since it is both an input as well as an output measure, expressing in a synthetic way the overall efficiency of company activities.

Equity is the best proxy for market capitalization of an unlisted company and it represents a good performance measure for companies as increases in equity reveal shareholders' confidence and a good profitability situation. The increase in equity originates from undistributed new net profit as well as from new shareholders' contributions. Obviously, when a company registers a constant increase in equity, it has most likely developed an efficient activity, which generated net profits in excess of minimum required dividend compensation, thereby creating self-financing capacity, essential when the companies needs to finance/co-finance new investments projects. This in turn encourages equity owners as well financial creditors to provide new capital whenever internal financing is not sufficient.

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To analyze the evolution of equity for sampled companies (201 unlisted Russian companies for the 2000-2015 period) we have used explanatory variables such as return on assets, debt-to-equity, cash, earning before taxes, current liquidity, quick liquidity, operating income, fixed assets, current assets turnover and sales.

Equity is not used very often as a performance measure, with return on assets (ROA), return on equity (ROE), return on net assets (RONA), economic profit, cash flow return on investments (CFROI) or market value added (MVA) being much more often encountered in the studies and researches from last 50 years.

For listed companies there is another possibility of analyzing company performances from this perspective, respectively market value of equity, as it represents a more objective reflection of real economic and financial performances. However, as most companies are not listed on stock-exchange markets, we had to use accounting equity instead.

As a performance measure accounting equity can have a problem, originating from the fact that sometimes small and medium companies distribute as dividends much of the net profit they obtain until they reach a certain size and level of their total assets. That creates a temporary disconnection between company performances and the size of their equity. Another issue can originate from the fact that part of equity increase originates from new contributions brought by existing shareholders, which is only indirectly connected with past or current company performances. However, on a longer time framework, such as the one we have used in our research (16 years) those problems will diminish significantly, making accounting equity a proper performance measure.

## 1. Literature review

McConnell and Servais (1990) studied the relation between Tobin's Q and the structure of equity ownership for a sample of about 1000 companies for the 1976-1986 period. The authors found a significant curvilinear relation between Q and the fraction of common stock owned by corporate insiders. The results they have obtained were consistent with the hypothesis that corporate value is a function of the structure of equity ownership.

Carpenter and Petersen (2002) investigated financing for a panel of 2400 small high-tech firms and found that new equity financing, in the form of initial public offering, is essential for ensuring the development of these companies. They also discovered that after going public a small number of such companies make appeal to external financing, either in the form of equity or debt.

Minton and Schrand (1999) analyzed the impact of cash flow volatility upon discretionary investment and the costs of debt and equity financing. The two authors demonstrated that cash flow volatility reduces both classical investments (in tangible fixed assets) as well as intangible investments (in research and development and advertising), increases the recourse to capital markets and the costs of financing.

Hovamikian *et al.* (2004) explored the determinants of target capital structure in case of dual debt and equity issues, studying whether market and operating performance influence the financing approach of the company. Two of their main findings were companies with a high market to book ratio have low target debt ratios, respectively that high stock returns increase the probability of issuing equity, yet with no influence upon target leverage. Brown *et al.* (2009) analyzed the connection between growth and financial innovation in the context of the 1990's R&D boom. They concluded that US companies finance R&D from volatile sources, such as cash flow and stock issues and that there is significant connection between financing, innovation and growth.

From a more recent perspective, the one of corporate governance, Mande *et al.* (2011) investigate whether good corporate governance matters in choosing between equity and debt financing. For a sample of 2,000 US debt and equity issuances for the 1998 to 2006 period, the authors found that their chosen measures of corporate governance effectiveness had a positive impact for selecting equity over debt as a financing option. They stated that pecking order hypothesis can be mitigated by a good governance and that companies with high agency costs should invest in corporate governance mechanisms to lower these costs.

Hirth and Viswanatha (2011) analyzed the relation between the financing constraints, cash flow risks and corporate investment and discovered the existence of a trade-off between the financing cost for present and future investments and that financing costs from today are more important than risks of future financing costs. The two authors also concluded that the effects of change in cash holdings is influenced by the level of cash holdings and that the effect of change in cash-flow risk depends on level of cash holdings. In other words, cash-rich companies tend to invest in less favorable projects, foregoing their real option to wait if they have less cash or if their future cash flows are riskier.

Huang and Sun (2018) analyzed the driver of asset growth and found that institutional restrictions on equity financing impair companies' ability to increase their assets. The results were different across countries, with asset growth being weaker in the countries which have the highest restrictions on stock issuance and buyback.



Silaghi (2018) investigated the use of equity in debt renegotiation and found that companies with larger volatility, lower cash flow growth rates, or higher recovery rates are more likely to use equity financing in debt renegotiation. Silaghi also found that when equity issuance is a possible source of financing in renegotiation, firms usually choose smoother coupons and welfare increases as compared to pure debt for debt swaps.

Walkshäusl (2015) investigated the correlation between equity financing and European value-growth returns. The researcher found, that similar to the situation from United States, European value-growth returns are very dependent upon the valuation signals included in company's equity financing activities. Walkshäusl concluded that the large return differences between value purchasers and growth issuers cannot be explained by common risk factors and most likely the observed value-growth returns can be attributed to mispricing.

Nguyen and Rugman (2015) studied the correlation between internal equity financing and the performance of multinational subsidiaries in emerging economies. They found that firm specific advantage of internal financing improves the performances of the subsidiary, that over 90% of financing sources in the British subsidiaries come from internal funding and that subsidiary-level financial management decision-making has a statistically significant positive impact on subsidiary performance.

Moreover, another strategic decision is what mix debt-equity financing to use? From Modigliani and Miller (1958) and currently there are intensive research studies on this question, but not a final answer is given. Thus, the old and new debate is ongoing if there is an optimal capital structure? Studies and underlined theories such as: trade-off, pecking order or agency costs still don't provide unique evidence regarding the relationship between capital structure and several variables (tangibility, growth, profitability, tax shield, ownership, age, size, volatility, industry, bankruptcy, macroeconomic environment, etc).

## 2. Choice of variables

Whereas majority of studies are focused on debt or equity as financing sources, in this study we are focused on equity as a performance measure. Thus, we try to examine some potential drivers of the equity evolution for 201 unlisted Russian firms for the 2000 to 2015 period. To account for the influence of the great financial global crisis from 2008, we have split the examined period into two sub periods: (1) before crisis and (2) during and after crisis. We have also taken into consideration the industry effect.

We have used as regressors Return on Assets (ROA), debt to equity, cash, earnings before taxes, current liquidity, quick liquidity, operating income, fixed assets, current assets turnover and sales.

We have chosen ROA as it represents the most synthetic overall economic performance measure of any company, *i.e.* the efficiency of employing all company assets, no matter how they are financed. ROA has to be positive, growing compared to precedent period (with an index higher than one) and above interest rate. When ROA is above interest rate it secures a supplementary net profit to the company (a profit which does not originate from the capital invested by equity owners) which can be directed toward compensating the shareholders (via dividends and other compensations) and for increasing the equity (increasing self-financing capacity).

Debt to equity ratio expresses financial leverage, whose efficient use by the company generates positive effects for shareholders and their equity.

We have chosen current and quick liquidity since they express the efficiency of companies' working capital policies and strategies. Operating income was chosen as it expresses the main source for covering various financial commitments (taxes, interest payments, dividends) and for future development (as the source for self-financing capacity). Current assets turnover is the most synthetic form of current assets' efficiency and it has a direct impact upon both company liquidity and profitability.

Table 1 presents definition of examined variables in this study. As it can be noticed, we have combined and used a mix of financial position and performance articles. Equity is a balance sheet article, but it is influenced and on same time influences several financial performance indicators.

Table 1. Definition of variables

Ratio/Definition	Abbreviation	Calculation, explanation
Equity	equity	Book value of equity
Return on assets	roa	Net income/Total assets
Debt to equity	debt2equity	Debt/Equity
Cash	cash	Cash and its equivalents > 0
Earnings before taxes	ebt	Earnings before taxes
Current liquidity	curr_liq	Current assets/Current liabilities
Quick liquidity	quick_liq	(Current assets – Inventories)/Current liabilities
Operating income	operat_profit	Gross profit – Operating expenses

Ratio/Definition	Abbreviation	Calculation, explanation
Fixed assets	fix_assets	Fixed assets > 0
Current assets turnover	cat	Sales/Current assets
Sales	sales	Sales > 0

Source: the authors

### 3. Methodology and data

#### 3.1. Methodology

The paper is aimed at studying the dynamics of equity in non-listed firms. To consider the heterogeneity of firm we use dynamic panel regression with individual effects. In line with Gaud (2005) we apply equations below for the equity adjustment process.

$$y_{it} - y_{it-1} = \alpha(y_{it}^* - y_{it-1}), \quad (1)$$

where  $y_{it}$  is  $i$ -th firms' equity at time  $t$ ;  $i = \overline{1, n}$ , where  $n$  is the number of firms;  $t = \overline{1, T}$ , where  $T$  is the length of the sample in years;  $\alpha$  characterizes the speed of adjustment and  $0 < \alpha < 1$ ;  $y_{it}^*$  is target level of equity, which is modeled as:

$$y_{it}^* = \beta' x_{it} + \mu_{it}, \quad (2)$$

where  $x_{it}$  are explanatory variables,  $\beta'$  is a transposed vector of coefficients,  $\mu_{it}$  is error term. The equations above yield the following:

$$y_{it} = (1 - \alpha)y_{it-1} + \alpha\beta' x_{it} + \alpha\mu_{it} = (1 - \alpha)y_{it-1} + \tilde{\beta}' x_{it} + \tilde{\mu}_{it}, \quad (3)$$

The error term  $\tilde{\mu}_{it}$  can in turn be represented as the sum of time-invariant individual effects  $\lambda_i$  and white noise  $v_{it}$ . The resulted equation is the following:

$$y_{it} = (1 - \alpha)y_{it-1} + \tilde{\beta}' x_{it} + \lambda_i + v_{it}, \quad (4)$$

We estimate the last equation by GMM as proposed in Arellano and Bond (1991). Firstly, (4) is differenced to eliminate the individual effects  $\lambda_i$ :

$$\Delta y_{it} = (1 - \alpha)\Delta y_{it-1} + \tilde{\beta}' \Delta x_{it} + \Delta v_{it}, \quad (5)$$

Equation (5) cannot be consistently estimated via OLS, since  $\Delta y_{it-1}$  is endogenous due to the correlation with  $\Delta v_{it}$ . Arellano and Bond (1991) propose using lagged values of  $y_{it}$  as valid instruments for  $\Delta y_{it-1}$ , specifically for each  $t$  from 3 to  $T$  the instrument set includes  $(y_{i1}, \dots, y_{i,t-2})$ . The resulting Arellano-Bond estimator is the following:

$$\left( \sum_{i=1}^n e_i' Z_i \right) W \left( \sum_{i=1}^n Z_i' e_i \right), \quad (6)$$

where:  $Z_i$  is the matrix of instruments for each  $i$ ;  $e_i$  is a residual term,  $e_i = \Delta y_{it} - (1 - \alpha)\Delta y_{it-1} - \tilde{\beta}' \Delta x_{it}$ ;  $W$  is GMM weighting matrix, which can be chosen optimally as in, for example, Hansen (1982).

Parameters  $\alpha$  and  $\tilde{\beta}$  are obtained by two-step procedure through the minimization of (6). Going back to equation (1) typically can be three cases regarding adjustment speed value.

Firstly, if  $\alpha = 0$  then  $y_{i,t} = y_{i,t-1}$ . This is the case where firms don't adjust at all equity financing, *i.e.* current year equity financing is similar as previous one. Secondly, if  $\alpha = 1$  then  $y_{i,t} = y_{i,t}^*$ . This is the case where firms adjust full equity financing toward the target ratio, *i.e.* there is a perfect adjustment. Thirdly, if  $0 < \alpha < 1$  then there is an incomplete adjustment process.

As described in Choice of variables section we use *roa*, *debt2equity*, *cash*, *ebt*, *curr\_liq*, *quick\_liq*, *operat\_profit*, *fix\_assets*, *cat* and *sales* as explanatory variables. All the variables are lagged in order to capture deferred effects on equity. The resulted equation is:

$$\begin{aligned} \text{equity} = & \text{equity}_{(t-1)} + \text{roa} + \text{roa}_{(t-1)} + \text{debt2equity} + \text{debt2equity}_{(t-1)} + \text{cash} + \text{cash}_{(t-1)} + \text{ebt} + \text{ebt}_{(t-1)} + \text{curr\_liq} \\ & + \text{curr\_liq}_{(t-1)} + \text{quick\_liq} + \text{quick\_liq}_{(t-1)} + \text{operat\_profit} + \text{operat\_profit}_{(t-1)} + \text{fix\_assets} + \text{fix\_assets}_{(t-1)} + \text{cat} \\ & + \text{cat}_{(t-1)} + \text{sales} + \text{sales}_{(t-1)} \end{aligned} \quad (4)$$

### 3.2. Data

The sample we have studied includes 201 firms for 16 years with some missing values and 11 time-varying variables in the sample. Selected firms are belonging to 52 different industries. The period under consideration lasts from 2000 till 2015. The data are collected from Spark-Interfax database (<http://www.spark-interfax.ru/en/>). Initially, data are checked for non-usual and non-logical observations such as, for example, sales, cash, etc. cannot be negatives. Thus, after corrections totally 3,212 observations remained for further examination.

### 4. Empirical results

Descriptive statistics (see Table 2) show that selected firms generated sales from 0.58 to 462,962 rubles; EBT from -55,836 to 233,918 rubles; and operating profit from -8,163 to 244,946 rubles. Firms have ratio on average 2.29 debt-to-equity; current liquidity 4.05; quick ratio 3.14; and ROA 0.27. These results denote that selected firm on average are profitable and liquid.

Table 2. Descriptive statistics

Variables	N	Min.	Mean	Max.	St.dev.	Skewn.	Kurt.
Sales	3212	0.58	8,482.33	462,962.06	37,141.93	6.93	56.99
debt2equity	3212	-398.20	2.29	274.32	14.58	-0.61	270.01
Ebt	3212	-55,835.85	1,893.08	233,917.97	11,256.72	9.79	131.14
operat_profit	3212	-8,162.79	2,294.14	244,945.91	13,680.86	9.92	125.60
equity	3212	-1,979.86	7,034.29	606,315.06	37,850.57	8.97	98.01
Cash	3212	0.00	623.14	185,021.95	5,200.94	21.51	631.16
fix_assets	3212	0.00	3,016.19	201,964.00	15,593.09	8.21	79.54
Roa	3212	-0.92	0.27	444.15	8.32	52.32	2,783.45
Cat	3212	0.00	1.64	624.99	11.08	55.43	3,118.21
curr_liq	3212	0.01	4.05	652.19	18.44	22.33	657.80
quick_liq	3212	0.01	3.14	651.86	17.94	24.06	735.79

Source: data processing made by the authors

Before performing regressions, we did correlation analysis between equity and several balance sheet and income statement articles. Correlation is done by equity and respectively accounting articles, but not as own examined variables (ratios). Thus, results are: gross profit (0.28), revenue (0.51), debt-to-equity (-0.01), earnings before tax (0.78), operating profit (0.77), net assets (0.99), current liabilities (0.80), current assets (0.89), and total assets (0.94).

By definition, it is expected to have a positive correlation between equity and income statement articles such as revenue, gross profit, earning before tax and operating profit. However, in the line with our research objective, alone other findings, there is a strong positive correlation between equity and net assets, current assets, and total assets as well. The obtained results indicate clearly that there is significant owners' trust to invest money into business activities and thus growing up net assets, first of all. On the other hand, firms with higher equity also have higher current liabilities. In turn this means that lenders and creditors trusted and supported businesses' growth.

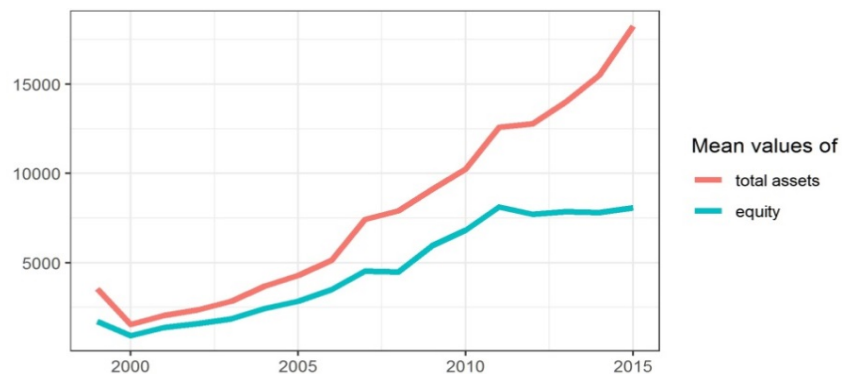
Figure 1 below presents mean values of total assets and equity. Viewed as a trend line, it is obviously that assets grew from 2000 to 2015 and equity is in the same line until 2011. This is an indicative result that owners have trusted and invested own money to develop businesses.

The difference between assets and equity line presents debt financing (see Figure 1 below). For the 1999-2015 period there is a negative trend line for both short and long-term interest rates (see Figure 5 or more: OECD 2018). Long-term interest rates decreased at a more obvious rate. Thus, lower interest rates have supported assets' (current and non-current) growth.

Total assets increased significantly from 2011 to 2015 as opposed to the non-matching trend line of equity. Obviously, during these sub-period assets were less financed by equity as compared to previous years. Question that is arises here is whether firms have used interest or non-interest-bearing liabilities? Looking more closely we can notice that in the 2011-2015 period short-term interest rates increased faster than long-term interest rates. Thus, while in 2011 short-term interest rate was 5.5%, in 2015 it reached 14.8%. On the other hand, in 2011, long-term interest rate was 8.1% as compared to 10.9% in 2015.

Undoubtedly, increased interest rates haven't stimulated new current and long-term investments. This leads to a rational explanation that assets were financed probably with non-interest-bearing liabilities such as trade payables or other forms of liabilities such as accrued compensation, deferred taxes and others alike.

Figure 1. Mean values of total assets and equity



Source: data processing made by the authors

The estimates, obtained using the Arellano-Bond (1991) method, are presented in the Table 3 below.

Table 3. Estimation results

Variables	Estimate	Std. Error	z-value	Pr(> z )	
equity <sub>(t-1)</sub>	0.92	0.01	113.00	0.00	***
roa <sub>t</sub>	-306.90	225.48	-1.36	0.17	
roa <sub>(t-1)</sub>	145.77	146.94	0.99	0.32	
debt2equity <sub>t</sub>	0.23	0.73	0.32	0.75	
debt2equity <sub>(t-1)</sub>	1.18	0.88	1.34	0.18	
cash <sub>t</sub>	-0.18	0.02	-8.26	0.00	***
cash <sub>(t-1)</sub>	0.24	0.04	6.39	0.00	***
ebt <sub>t</sub>	0.98	0.01	73.03	0.00	***
ebt <sub>(t-1)</sub>	-0.33	0.01	-34.33	0.00	***
curr_liq <sub>t</sub>	-4.20	3.80	-1.10	0.27	
curr_liq <sub>(t-1)</sub>	-3.44	3.33	-1.03	0.30	
quick_liq <sub>t</sub>	5.00	6.68	0.75	0.45	
quick_liq <sub>(t-1)</sub>	3.40	3.49	0.97	0.33	
operat_profit <sub>t</sub>	-0.19	0.06	-3.22	0.00	**
operat_profit <sub>(t-1)</sub>	0.28	0.01	22.73	0.00	***
fix_assets <sub>t</sub>	0.39	0.04	10.90	0.00	***
fix_assets <sub>(t-1)</sub>	-0.79	0.05	-16.40	0.00	***
cat <sub>t</sub>	-37.94	30.38	-1.25	0.21	
cat <sub>(t-1)</sub>	16.36	28.36	0.58	0.56	
sales <sub>t</sub>	-0.04	0.05	-0.77	0.44	
sales <sub>(t-1)</sub>	-0.02	0.02	-1.62	0.11	
Wald test	0.00000				
Sargan Test	0.40743				
Autocorrelation test, 1 lag	0.035007				

Note: Significance level: \*\*\* - 1%, \*\* - 5%, \* - 10%.

Source: data processing made by the authors

We performed the Sargan test (see Sargan 1988, Hansen 1982) to check the validity of overidentification restrictions. According to the Table 3 we cannot reject the null for the Sargan test, so we have no reason to doubt the absence of correlation between instruments and the error term. We calculated robust standard errors for coefficients, as first order autocorrelation is present, but only on the 5% level. The regression is significant on any reasonable level according to the Wald test.

The coefficient for lagged dependent variable equity<sub>(t-1)</sub> equals to 0.92 and is significant on any reasonable level. Evidently that dynamic effects are present in the model and the OLS estimates are inconsistent. Our analysis

reveals that some of the proposed financial indicators influence the dynamics of equity<sub>t</sub>. They are cash, ebt, operat\_profit and fix\_assets. All of them are significant together with their lagged values on any reasonable level.

Results denote that adjustment speed  $\alpha$  is 0.08 (1 – 0.92). Generally speaking, this result shows that firms adjust equity toward the target ratio by 8 per cent annually on average. In other words, firms adjust slowly enough their equity financing policy and the equity adjustment process takes more than ten years need to be completed toward the full target financing. The low level of  $\alpha$  indicates that adjustment process was costly.

Moreover, results denote that firms with higher cash and operating profit in the actual year used less, whereas in the previous year used more equity financing. On the other hand, firms that generated more earnings before taxes and that have more long-term tangible assets in the actual year used more equity financing, whereas in the previous year used less.

The results obtained can be explained as follows. Year-after-year equity financing increased and this is a good sign of trust from shareholders' perspective. Current year equity financing is positively affected by previous year's one.

Firms with higher cash ratio and which generated more operating profit were evaluated more by creditors rather than shareholders in the actual year, whereas in the previous year the opposite happened, respectively more by the shareholders rather than by creditors. It is important that both groups of investors based their evaluations on these two indicators.

Furthermore, firms that generated more earnings before taxes and that have more long-term tangible assets probably convinced shareholders to finance the business more with equity rather making use of debt in current year. In previous year firms relied more on debt rather on equity financing.

## 5. Robustness check

Firstly, we assess equation 4 for the whole sample using different estimators, namely GMM, pooled Ordinary Least Squares (OLS), Fixed Effects, Random Effects (both with individual effects) and General Least Squares Random Effects (GLS RE) to account for heteroskedasticity. The results are presented in Table 4 below.

Table 4. Robustness check for whole period

Variables	GMM		Pooled OLS		Fixed effects		Random effects		GLS RE	
	Estimate	Pr(> z )	Estimate	Pr(> z )	Estimate	Pr(> z )	Estimate	Pr(> z )	Estimate	Pr(> z )
Intercept			492.92	0.01			835.48	0.01	28.29	0.21
equity <sub>(t-1)</sub>	0.92	0.00	0.94	0.00	0.87	0.00	0.89	0.00	0.95	0.00
roa <sub>t</sub>	-306.90	0.17	-170.88	0.82	-1031.16	0.28	-491.66	0.57	-271.74	0.00
roa <sub>(t-1)</sub>	145.77	0.32	0.37	0.98	-33.95	0.02	-13.52	0.33	78.56	0.00
debt2equity <sub>t</sub>	0.23	0.75	-3.91	0.66	-1.18	0.90	-2.44	0.79	-0.38	0.09
debt2equity <sub>(t-1)</sub>	1.18	0.18	-1.20	0.89	2.01	0.83	0.38	0.97	0.61	0.27
cash <sub>t</sub>	-0.18	0.00	-0.42	0.00	-0.45	0.00	-0.45	0.00	-0.15	0.00
cash <sub>(t-1)</sub>	0.24	0.00	0.49	0.00	0.53	0.00	0.50	0.00	0.88	0.00
ebt <sub>t</sub>	0.98	0.00	1.20	0.00	1.12	0.00	1.15	0.00	0.91	0.00
ebt <sub>(t-1)</sub>	-0.33	0.00	-0.11	0.00	-0.13	0.00	-0.12	0.00	-0.34	0.00
curr_liq <sub>t</sub>	-4.20	0.27	-1.66	0.97	-10.10	0.84	-7.94	0.87	-6.13	0.00
curr_liq <sub>(t-1)</sub>	-3.44	0.30	-2.74	0.95	-12.21	0.81	-9.31	0.85	-7.22	0.00
quick_liq <sub>t</sub>	5.00	0.45	4.87	0.92	14.90	0.78	11.51	0.82	6.19	0.01
quick_liq <sub>(t-1)</sub>	3.40	0.33	-0.16	1.00	9.57	0.86	6.25	0.90	5.65	0.05
operat_profit <sub>t</sub>	-0.19	0.00	-0.59	0.00	-0.54	0.00	-0.54	0.00	-0.10	0.00
operat_profit <sub>(t-1)</sub>	0.28	0.00	0.07	0.10	0.14	0.00	0.14	0.00	0.30	0.00
fix_assets <sub>t</sub>	0.39	0.00	0.51	0.00	0.46	0.00	0.49	0.00	0.45	0.00
fix_assets <sub>(t-1)</sub>	-0.79	0.00	-0.65	0.00	-0.64	0.00	-0.65	0.00	-0.56	0.00
cat <sub>t</sub>	-37.94	0.21	-180.75	0.08	-209.85	0.26	-245.45	0.09	143.10	0.00
cat <sub>(t-1)</sub>	16.36	0.56	0.09	0.99	3.97	0.69	1.63	0.87	41.24	0.00
sales <sub>t</sub>	-0.04	0.44	0.03	0.05	0.03	0.04	0.03	0.04	-0.07	0.00
sales <sub>(t-1)</sub>	-0.02	0.11	0.00	0.84	0.00	0.94	0.00	0.95	0.02	0.00
R <sup>2</sup>				0.97062		0.83194		0.94183		0.94183
Wald test		0.00000		0.00000		0.00000		0.00000		
Sargan Test		0.40743								
Autocorrelation test, 1 lag		0.035007		0.00000		0.00000		0.00000		0.00000

Source: data processing made by the authors

The  $1 - \alpha$  term from equation (3) is significant for all estimation methods. As for the other coefficients, in general they remain stable, but there are some exceptions, e.g., lagged quick liquidity; ROA is significant in case of GLS RE. All the models are significant but exhibit serial correlation. We remedy this issue by implementing robust standard errors for coefficients. We have subsequently divided the sample into two parts due to financial crisis effects, respectively before 2008 (without including) and after 2008 (including) and estimated equation (4) for these subsamples. The estimates with p-values for the first period are presented in Table 5.

Table 5. Robustness check for the pre-2008 period

Variables	GMM		Pooled OLS		Fixed effects		Random effects		GLS RE	
	Estimate	Pr(> z )	Estimate	Pr(> z )	Estimate	Pr(> z )	Estimate	Pr(> z )	Estimate	Pr(> z )
Intercept			84.82	0.35			81.08	0.61	47.13	0.33
equity <sub>(t-1)</sub>	0.57	0.00	0.82	0.00	0.77	0.00	0.79	0.00	0.83	0.00
roa <sub>t</sub>	-458.39	0.44	-421.67	0.22	-392.54	0.46	-323.28	0.45	-182.92	0.41
roa <sub>(t-1)</sub>	-401.42	0.33	1.58	0.67	-5.11	0.24	-1.83	0.63	3.06	0.54
debt2equity <sub>t</sub>	-0.81	0.44	-1.31	0.64	-0.54	0.87	-0.90	0.75	-0.90	0.64
debt2equity <sub>(t-1)</sub>	-0.24	0.84	-0.02	1.00	0.72	0.86	0.21	0.95	0.34	0.78
cash <sub>t</sub>	0.99	0.00	1.03	0.00	1.07	0.00	1.14	0.00	0.87	0.00
cash <sub>(t-1)</sub>	-0.96	0.00	-0.97	0.00	-0.92	0.00	-0.89	0.00	-0.93	0.00
ebt <sub>t</sub>	0.96	0.01	1.27	0.00	1.29	0.00	1.25	0.00	1.13	0.00
ebt <sub>(t-1)</sub>	0.06	0.52	-0.14	0.02	0.04	0.54	-0.03	0.56	-0.17	0.00
curr_liq <sub>t</sub>	1.97	0.66	1.83	0.92	2.50	0.90	2.57	0.89	0.45	0.97
curr_liq <sub>(t-1)</sub>	1.69	0.60	-1.32	0.94	-2.83	0.89	-1.11	0.95	1.11	0.86
quick_liq <sub>t</sub>	3.14	0.62	-0.70	0.97	2.99	0.90	-0.37	0.99	0.40	0.98
quick_liq <sub>(t-1)</sub>	0.15	0.98	-0.58	0.98	6.57	0.81	1.02	0.96	-5.29	0.64
operat_profit <sub>t</sub>	-0.84	0.06	-1.19	0.00	-1.28	0.00	-1.21	0.00	-1.10	0.00
operat_profit <sub>(t-1)</sub>	0.95	0.00	0.98	0.00	0.87	0.00	0.94	0.00	1.03	0.00
fix_assets <sub>t</sub>	0.47	0.01	0.34	0.00	0.31	0.00	0.41	0.00	0.31	0.00
fix_assets <sub>(t-1)</sub>	-0.42	0.04	-0.24	0.00	-0.33	0.00	-0.35	0.00	-0.16	0.00
cat <sub>t</sub>	-14.09	0.76	-16.52	0.69	-37.82	0.67	-27.41	0.66	-20.28	0.42
cat <sub>(t-1)</sub>	-10.91	0.74	0.28	0.92	2.93	0.34	1.90	0.50	2.10	0.46
sales <sub>t</sub>	0.07	0.58	0.03	0.43	0.16	0.00	0.10	0.00	0.07	0.00
sales <sub>(t-1)</sub>	-0.01	0.94	0.01	0.85	-0.11	0.02	-0.07	0.09	-0.06	0.01
R <sup>2</sup>			0.97276		0.75258		0.9652		0.99537	
Regression significance	1.00000		0.00000		0.00000		0.00000			
Sargan Test	0.33982									
Autocorrelation test, 1 lag	0.28763		0.00000		0.06169		0.9263			

Source: data processing made by the authors

$1 - \alpha$  is significant, yet it became lower than for the whole sample, signifying a faster adjustment process. Some coefficients again reveal a volatile behavior. Mainly, this applies to coefficients which are expressed in shares (such as debt2equity<sub>t</sub>, roa<sub>t</sub> and others), since variables in levels have huge outliers. Robustness check for the post-2008 is shown in Table 6.

Table 6. Robustness check for the post-2008 period

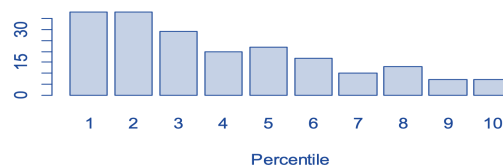
Variables	GMM		Pooled OLS		Fixed effects		Random effects		GLS RE	
	Estimate	Pr(> z )	Estimate	Pr(> z )	Estimate	Pr(> z )	Estimate	Pr(> z )	Estimate	Pr(> z )
Intercept			580.12	0.10			2,395.22	0.02	232.53	0.09
equity <sub>(t-1)</sub>	0.00	0.99	0.96	0.00	0.80	0.00	0.88	0.00	1.01	0.00
roa <sub>t</sub>	-206.53	0.67	-1,673.99	0.34	-1692.37	0.38	-1,637.88	0.37	-550.82	0.40
roa <sub>(t-1)</sub>	-1,454.45	0.01	2326.73	0.20	115.71	0.95	1,074.35	0.57	937.76	0.13
debt2equity <sub>t</sub>	-3.43	0.37	-10.22	0.69	-3.58	0.90	-5.62	0.83	-4.16	0.68
debt2equity <sub>(t-1)</sub>	0.97	0.71	-1.59	0.95	4.76	0.85	3.53	0.88	-2.12	0.80
cash <sub>t</sub>	-0.49	0.01	-0.40	0.00	-0.47	0.00	-0.48	0.00	-0.27	0.00
cash <sub>(t-1)</sub>	0.02	0.85	0.52	0.00	0.59	0.00	0.46	0.00	0.42	0.00
ebt <sub>t</sub>	0.68	0.00	1.35	0.00	1.14	0.00	1.15	0.00	1.10	0.00
ebt <sub>(t-1)</sub>	0.72	0.00	-0.24	0.00	-0.18	0.00	-0.30	0.00	-0.16	0.00
curr_liq <sub>t</sub>	-2.35	0.91	-3.68	0.97	-22.13	0.84	-19.28	0.85	-1.16	0.97
curr_liq <sub>(t-1)</sub>	-24.63	0.22	1.38	0.99	-18.24	0.86	-22.62	0.82	2.45	0.93

Variables	GMM		Pooled OLS		Fixed effects		Random effects		GLS RE	
	Estimate	Pr(> z )	Estimate	Pr(> z )	Estimate	Pr(> z )	Estimate	Pr(> z )	Estimate	Pr(> z )
quick_liq <sub>t</sub>	3.81	0.87	8.88	0.93	27.84	0.80	24.74	0.81	0.87	0.98
quick_liq <sub>(t-1)</sub>	25.65	0.20	-5.77	0.95	14.78	0.89	18.20	0.86	-2.02	0.95
operat_profit <sub>t</sub>	-0.46	0.16	-0.53	0.00	-0.46	0.00	-0.30	0.00	-0.46	0.00
operat_profit <sub>(t-1)</sub>	0.15	0.42	-0.18	0.00	-0.06	0.44	0.05	0.48	-0.15	0.00
fix_assets <sub>t</sub>	0.23	0.08	0.50	0.00	0.16	0.01	0.28	0.00	0.42	0.00
fix_assets <sub>(t-1)</sub>	-0.47	0.03	-0.62	0.00	-0.56	0.00	-0.61	0.00	-0.52	0.00
cat <sub>t</sub>	-706.48	0.18	-344.73	0.44	-386.89	0.43	-381.86	0.40	-137.60	0.39
cat <sub>(t-1)</sub>	-206.92	0.38	58.59	0.89	-31.43	0.95	-179.20	0.71	38.44	0.80
sales <sub>t</sub>	0.07	0.43	0.02	0.20	0.03	0.15	0.02	0.36	0.00	0.80
sales <sub>(t-1)</sub>	0.03	0.46	0.01	0.73	0.01	0.55	0.01	0.52	0.00	0.91
R <sup>2</sup>			0.96247		0.6259		0.82207		0.97706	
Regression significance	1.00000		0.00000		0.00000		0.00000			
Sargan Test	0.33982									
Autocorrelation test, 1 lag	0.28763		0.00000		0.00000		0.00000			

Source: data processing made by the authors

1 -  $\alpha$  is significant for all models except the dynamic one. The regression estimated by GMM is insignificant on any reasonable level. We also do robustness check for firms' size and use the logarithm of sales in 2015 as a proxy for the size. The quantity of firms in each percentile is presented in Figure 2 below.

Figure 2. Quantity of firms in each percentile of firms' size



Source: data processing made by the authors

We form subsamples of several percentiles in order to make the subsamples approximately equal, see Table 7).

Table 7. Robustness check for different firm size, fixed effects

Variables	1-2 percentiles		3-4 percentiles		5-7 percentiles		8-10 percentiles	
	Estimate	Pr(> t )	Estimate	Pr(> t )	Estimate	Pr(> t )	Estimate	Pr(> t )
equity <sub>(t-1)</sub>	0.89	0.00	0.79	0.00	0.87	0.00	0.87	0.00
roa <sub>t</sub>	9.04	0.27	-160.54	0.00	-1,029.89	0.28	-1,029.89	0.28
roa <sub>(t-1)</sub>	-9.39	0.19	-45.89	0.35	-33.71	0.02	-33.71	0.02
debt2equity <sub>t</sub>	0.02	0.64	-0.12	0.89	-1.18	0.90	-1.18	0.90
debt2equity <sub>(t-1)</sub>	0.01	0.88	0.46	0.50	1.99	0.84	1.99	0.84
cash <sub>t</sub>	0.00	0.89	0.17	0.16	-0.45	0.00	-0.45	0.00
cash <sub>(t-1)</sub>	-0.28	0.00	0.06	0.63	0.53	0.00	0.53	0.00
ebt <sub>t</sub>	0.79	0.00	0.82	0.00	1.12	0.00	1.12	0.00
ebt <sub>(t-1)</sub>	-0.03	0.45	0.12	0.15	-0.13	0.00	-0.13	0.00
curr_liq <sub>t</sub>	0.23	0.60	1.97	0.59	-10.19	0.84	-10.19	0.84
curr_liq <sub>(t-1)</sub>	-0.18	0.70	1.74	0.58	-12.20	0.81	-12.20	0.81
quick_liq <sub>t</sub>	-0.29	0.52	-0.86	0.86	15.03	0.78	15.03	0.78
quick_liq <sub>(t-1)</sub>	0.24	0.61	-4.66	0.34	9.60	0.86	9.60	0.86
operat_profit <sub>t</sub>	-0.10	0.28	0.17	0.36	-0.54	0.00	-0.54	0.00
operat_profit <sub>(t-1)</sub>	0.30	0.00	-0.08	0.64	0.14	0.00	0.14	0.00
fix_assets <sub>t</sub>	0.58	0.00	0.24	0.00	0.47	0.00	0.47	0.00
fix_assets <sub>(t-1)</sub>	-0.52	0.00	-0.20	0.01	-0.65	0.00	-0.65	0.00
cat <sub>t</sub>	-1.37	0.41	-15.36	0.06	-209.73	0.26	-209.73	0.26
cat <sub>(t-1)</sub>	0.17	0.89	6.91	0.45	3.93	0.70	3.93	0.70
sales <sub>t</sub>	0.05	0.29	0.13	0.05	0.03	0.04	0.03	0.04
sales <sub>(t-1)</sub>	-0.03	0.63	-0.11	0.09	0.00	0.96	0.00	0.96

Source: data processing made by the authors

There is around ten percent change comparing firms in 3-4 percentiles with the rest of percentiles. Thus, firms in this category need around five years less for a completely adjustment equity process.

## 6. Industry effect

Each firm has industry classification code. Minimum, maximum and mean values of equity for each industry are presented in the Appendix. Industries with the smallest deviation include television programming and broadcasting activities, food and beverage service activities, publishing activities and manufacture of wearing apparel, whereas with highest deviation is extraction of crude petroleum and natural gas, telecommunications, etc.

We create dummies for industries with the highest and the lowest equity, represented by *industry\_high\_equity* and *industry\_low\_equity* correspondingly. The results are displayed in the Table 8 below. Industry effects, which are incorporated this way in the regression, are insignificant. The same is for simultaneous effects with lagged equity (see Table 9).

Table 8. Pooled OLS for the regression (4) with industry dummies

Variable	Estimate	Std. Error	z-value	Pr(> z )	
Intercept	414.73	207.15	2.00	0.05	**
equity <sub>(t-1)</sub>	0.94	0.01	114.09	0.00	***
roa <sub>t</sub>	-215.08	770.62	-0.28	0.78	
roa <sub>(t-1)</sub>	-0.53	13.77	-0.04	0.97	
debt2equity <sub>t</sub>	-3.50	8.86	-0.40	0.69	
debt2equity <sub>(t-1)</sub>	-0.75	8.78	-0.09	0.93	
cash <sub>t</sub>	-0.42	0.03	-13.01	0.00	***
cash <sub>(t-1)</sub>	0.49	0.05	10.75	0.00	***
ebt <sub>t</sub>	1.20	0.03	39.75	0.00	***
ebt <sub>(t-1)</sub>	-0.11	0.03	-3.42	0.00	***
curr_liq <sub>t</sub>	-0.05	46.88	0.00	1.00	
curr_liq <sub>(t-1)</sub>	-1.33	47.52	-0.03	0.98	
quick_liq <sub>t</sub>	3.56	49.99	0.07	0.94	
quick_liq <sub>(t-1)</sub>	-1.38	50.79	-0.03	0.98	
operat_profit <sub>t</sub>	-0.59	0.04	-13.72	0.00	***
operat_profit <sub>(t-1)</sub>	0.07	0.04	1.65	0.10	
fix_assets <sub>t</sub>	0.51	0.03	15.12	0.00	***
fix_assets <sub>(t-1)</sub>	-0.65	0.04	-17.34	0.00	***
cat <sub>t</sub>	-192.01	104.01	-1.85	0.07	*
cat <sub>(t-1)</sub>	0.34	9.87	0.03	0.97	
sales <sub>t</sub>	0.03	0.01	1.91	0.06	**
sales <sub>(t-1)</sub>	0.00	0.01	0.14	0.89	
industry_low_equity	-34.94	730.98	-0.05	0.96	
industry_high_equity	518.17	321.37	1.61	0.11	

Source: data processing made by the authors

Table 9. Pooled OLS for the regression (4) with industry dummies and cross-product with adjustment speed

Variable	Estimate	Std. Error	z-value	Pr(> z )	
Intercept	272.15	212.22	1.28	0.20	
equity <sub>(t-1)</sub>	1.02	0.03	34.50	0.00	***
equity <sub>(t-1)</sub> * industry_low_equity	56.23	730.54	0.08	0.94	
equity <sub>(t-1)</sub> * industry_high_equity	652.69	323.91	2.02	0.04	**
roa <sub>t</sub>	-312.40	772.24	-0.40	0.69	
roa <sub>(t-1)</sub>	-0.48	13.75	-0.03	0.97	
debt2equity <sub>t</sub>	-2.96	8.85	-0.33	0.74	
debt2equity <sub>(t-1)</sub>	-0.11	8.77	-0.01	0.99	
cash <sub>t</sub>	-0.44	0.03	-13.38	0.00	***
cash <sub>(t-1)</sub>	0.45	0.05	9.61	0.00	***
ebt <sub>t</sub>	1.19	0.03	39.29	0.00	***
ebt <sub>(t-1)</sub>	-0.12	0.03	-3.92	0.00	***
curr_liq <sub>t</sub>	1.40	46.81	0.03	0.98	
curr_liq <sub>(t-1)</sub>	-1.15	47.45	-0.02	0.98	

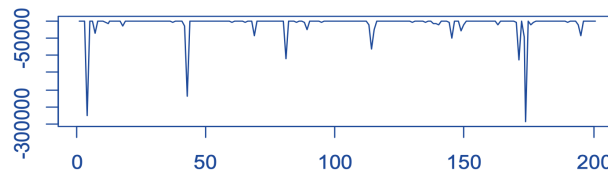


Variable	Estimate	Std. Error	z-value	Pr(> z )	
quick_liq <sub>t</sub>	2.17	49.92	0.04	0.97	
quick_liq <sub>(t-1)</sub>	-1.31	50.72	-0.03	0.98	
operat_profit <sub>t</sub>	-0.58	0.04	-13.36	0.00	***
operat_profit <sub>(t-1)</sub>	0.07	0.04	1.83	0.07	*
fix_assets <sub>t</sub>	0.51	0.03	15.03	0.00	***
fix_assets <sub>(t-1)</sub>	-0.65	0.04	-17.38	0.00	***
cat <sub>t</sub>	-164.31	104.26	-1.58	0.12	
cat <sub>(t-1)</sub>	0.62	9.86	0.06	0.95	
sales <sub>t</sub>	0.03	0.01	2.02	0.04	**
sales <sub>(t-1)</sub>	0.00	0.01	0.26	0.79	
industry_low_equity	0.68	11.34	0.06	0.95	
industry_high_equity	-0.09	0.03	-3.05	0.00	***

Source: data processing made by the authors

Figure 3 demonstrates the deviation from level of equity  $y^* - y$  for each firm in the sample, averaged by years. As it seen, there are several firms whose equity level is dramatically lower than their target level.

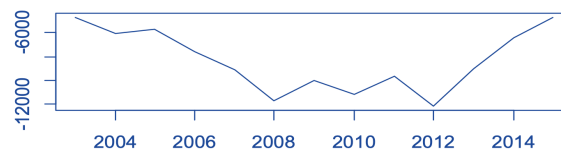
Figure 3. Average deviation from target level of equity for each firm



Source: data processing made by the authors

If we average the deviation by firms (from Figure 4), we can see that in 2008 and 4 years after the gap is substantially larger in absolute values, meaning that on crisis and after-crisis period the level of equity drops significantly from its target level in average.

Figure 4. Average deviation from target level of equity for each year



Source: data processing made by the authors

## Conclusions

While many research papers are focused on debt financing or debt-equity choice, in this paper we are focused on equity financing and equity as a performance measure. We tried to test some possible drivers of equity evolution for 201 unlisted Russian firms for the 2000 to 2015 period.

The evolution of equity is examined using a set of explanatory variables such as return on assets, debt-to-equity, cash, earning before taxes, current liquidity, quick liquidity, operating income, fixed assets, current assets turnover and sales. Examining the selected variables, our study tried to test investors' awareness about companies' financial position and performance indicators.

Results denoted that firms relied on equity financing and there was a positive trend line of equity financing. Equity appeared to be more appropriate financing source and is affected by lagged itself. Even so the adjustment process was rather slowly, with the results suggesting that firms have used a target equity policy. However, before the occurrence of the 2008 financial crisis, firms adjusted their equity at a faster pace compared to the after-crisis situation.

The paper provided evidence that some industries were closer to the target equity financing than others, and hence industry is confirmed as an important driver of equity financing. Moreover, firms' characteristics are confirmed also to be important drivers of the equity financing. Thus, firms with higher cash and operating income in the actual year used less equity financing, whereas firms which generated more earnings before taxes and that

have more fixed assets used more. This implied that both shareholders and creditors have judged investments based on these indicators.

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## Happiness Flight with Institutional Capabilities: Evidence of the Effects of Economic Freedom on Subjective Well-Being in Developing Countries

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### Abstract:

Recent empirical studies show that institutions are related to the elevation of subjective well-being in developing countries. Most of these studies use the change or increase in economic freedom and its impact on subjective well-being. None the less, the relative version of economic freedom is also feasible and none of the authors have analyzed this possibility. Furthermore, not much is discussed about the individual aspects of institutional capabilities valued by the citizens and how these preferences change the level of subjective well-being in developing countries. This study empirically analyzes whether institutional capabilities are conducive or detrimental to subjective well-being in a panel data of 30 countries between 1995 and 2014. This study attempts to close these gaps by conducting Random Effects analysis as an empirical strategy. Results show that both changes in economic freedom and its relative version are positively significant toward subjective well-being. The further finding indicates that the citizens of lower-middle-income and upper-middle-income countries are more sensitive to the access to sound money as compared to the citizens from higher-income countries.

**Keywords:** institutional capabilities; economic freedom; subjective well-being.

**JEL Classification:** E02; I31; O57.

### Introduction

The idea of the welfare state in developing countries after global financial crises led them to make significant changes in their economic policies aiming to remove trade barriers, ease of doing business, deregulation of labor markets,

liberalizing their financial sector and selling out inefficient state-owned firm. The focus on the private sector and innovations in the production process as their growth engine has led these countries toward a paradigmatic and ideological shift to free markets to enhance economic development. In the last few decades, it is noted that higher economic growth and changes in economic institutions toward financial liberalization, free entry to the markets, size of government and rule of law in developing countries have lifted millions of people from poverty across the world. There are a plethora of shreds of evidence which advocate the role of freedom of institutions for economic growth (North 1991, Barro 1996, De Haan and Siermann 1998, Cebula and Ekstrom 2009, Khan 2012, Bujanca and Ulman 2015, Acikoz *et al.* 2016, and Nadeem *et al.* 2019) but the idea that institutional changes do matter for subjective well-being is not clear.

In a general understanding that more inclusive economic institutions are important for economic growth and poverty reduction in developing countries but the relationship between institutional dynamics and subjective well-being is still a puzzle, which urges the researchers to check whether freedom of economic institutions does matter for subjective well-being in developing countries. So this study is an attempt to disentangle the role of changes in economic institutions captured by economic freedom measure in subjective well-being and to identify the exact channel of influence is one step forward to explore in more detail whether economic freedom adds in quality of life in developing countries. In the following section of the paper, we derive our hypotheses, section 3 explains the data set, and section 4 comprises two outcomes. First we show the effects of economic freedom index and its individual dimensions on SWB then we run our sensitivity analysis to examine this effect on different income countries. In section 6 we explain our contribution and draw conclusion on the basis of our findings.

## 1. Review of literature

A large number of studies extended the agenda of research by examining the relationship between subjective well-being and economic freedom. Literature about our concerned area can be divided into two main categories, one is based on the institutional determinants of subjective well-being and the other is based on social determinants of subjective well-being. As our focus is on the contribution of economic institutions for SWB, so we review the studies that explored the linkages between economic freedom and subjective well-being. A substantial number of studies of happiness literature advocate the importance of institutions across the countries.

According to North (1990), that a sound institutional framework enhances productivity behavior which stimulates economic growth. When economic freedom is expanded, even the poorest citizen of a country where there is property rights protection improves their well-being (Norton 1998). Esposito and Zaloski (1999) concluded that economic freedom improves the life expectancy and literacy rate which are the measures of quality of life in their analysis. Veenhoven (2000) examined a panel of 46 countries to disentangle the impact of economic freedom index on happiness and find that economic freedom is positively associated with happiness in poor countries where the capability to choose is very low. Ovaska and Takashima (2006) find that economic institutions are more important and have a significant impact on happiness while the impact of political institutions is insignificant. Helliwell (2003) examined the importance of institutions for life satisfaction by using micro-level data with a large number of control variables that could explain the variations in SWB and found that economic institutions are more important than political institutions. Bjornskov *et al.* (2010) find that the country has a lower income, the level of significance of economic institutions is higher and the countries having higher income, the significance of political institutions is higher. Inglehart *et al.* (2008) also confirm that freedom of economic institutions raised the level of subjective well-being and these effects differ among the poor and rich countries. Inclusiveness of economic institutions can easily understand when the level of economic freedom is varying. Rode (2013) concluded that the societies having inclusive economic institutions experiences higher economic growth which answers the question of whether more inclusiveness of economic institutions encourages more subjective well-being. Typically, the society having inclusiveness of their economic institutions enjoys greater market access, enforced protection of their property rights, stronger rule of law and better quality of regulations than those with less inclusiveness of economic institutions.

Grooper *et al.* (2011) documented a positive relationship between economic freedom and happiness with a cross-section analysis of more than 100 nations by using three different measures of happiness. The study found that the effect is strong in less developed countries with a lower level of economic freedom. Although the empirical evidence suggests that any change in economic freedom helps in explaining the observed level of subjective well-being but adding regional dummies in expanded equation deserve further analysis (Belasen and Hafer 2013). Spruk

and Keseljevic (2016) argued that both economic and political institutions have a positive significant impact on cross-country level of happiness with different model specifications and estimation techniques. Further panel data analysis revealed that subjective well-being decreased with an increase in economic freedom when controlling for income and state dependence over time. Several existing studies attempt to explain whether higher economic freedom breeds a higher level of subjective well-being with a systematic set of control variables. However, it remains a puzzle whether the relative standing of a country on economic freedom scale and efficient inclusiveness of economic institutions contribute to a higher level of subjective well-being. The hypothesis of our study regarding the effects of economic freedom and subjective well-being can be explained as follows:

- H<sub>1</sub>: An increase in the level of economic freedom adds to the subjective well-being with controlling the social and structural confounders (*i.e.* a set of control variables);
- H<sub>2</sub>: In cross-country analysis relative standing of a country might be important than the absolute standing while controlling heterogeneity and regional shocks.

## 2. Data and variables description

For the life satisfaction measure we use World Value Survey (WVS) and European Value Survey (EVS)<sup>1</sup> as our dependent variables and index of economic freedom and its dimensions as our main independent variables. Then we used a set of control variables to check gradually, how different model specification allows us to identify the exact relationship. The data of WVS and EVS is based on six surveys and used two indicators to measure subjective well-being such as overall life satisfaction and happiness with equal weightage and format in each wave (Inglehart *et al.* 2008). There are total 60045 individual observations that are aggregated at country level in latest four waves for our selected countries. We are using overall life satisfaction as a proxy for subjective well-being and it was measured by asking the question from the respondent that ‘how satisfied are you with your life these days?’ and measurement scale ranged between 1 (dissatisfied) to 10 (satisfied). For economic freedom there are two different data sources which provide comprehensive indexes such as, The Heritage Foundation which publishes its economic freedom index since 1995 and The Fraser Institute which publishes its data for a large number of countries since 1990 (Gwartney *et al.* 2015).

This study decided to use the data of economic freedom from Fraser Institute due to large sample size of countries because of its wide in literature and it is transparent to understand for the readers (De Haan, Sturm 2000 and Cummings 2000). The measurement of this index is based on the scale of 1-10 for each component and then aggregated with single index based on the averages of all sub-indexes. A society is considered freer if its economic activities are accompanied by voluntary exchanges of their assets, personal choice, open markets and enforced protection of property rights (Gwartney *et al.* 2009, 939). The best society with scale rating is that where the focus of government is on provision of public goods, property right protection, freedom to trade internationally and a sound monetary system.

### 2.1. Selection of control variables/Conditional independence

We learned that simple correlation does not reveal the causal relationship between economic freedom and subjective well-being because there is always the problem of selection bias in such kind of analysis. Control variables are the best solution to avoid the selection bias and we can also identify the causal effects between these two variables on an average basis. According to our assumption, that subjective well-being is a function of economic freedom *i.e.*

$$SWB = f(EF_i) \quad (1)$$

and there is conditional independence, then the one-point change in economic freedom would be:

$$E[SWB_{it}(EF_{it}) - SWB_{it}(EF_{it} - 1)] [X_{it}] \quad (2)$$

where: “ $X_i$ ” is a set of control variables. Although the selection of control variables is the choice of researchers we want to avoid any objection regarding our outcomes so we choose to follow the set of control variables as

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<sup>1</sup> In the data set available on the WVS homepage, the data of the European countries was missing so we included data from the European Value Surveys (EVS).

Gehring (2013) with an addition of human capital development which can contribute to subjective well-being across the countries.

Our set of control variables include, GDP per capita used a proxy for income, belief in God to measure the intensity of religious practices and believes, social trust to measure the quality of formal institutions, government share as percentage of GDP to measure the involvement of government in economic activities and investment price level to measure the business climate of the countries as higher value show the higher local demand of investment goods (Bjornskov *et al.* 2007).

### 3. Empirical specification and estimation approach

#### 3.1. Empirical model

To determine if economic freedom and subjective well-being across the countries are empirically related, our model specification is as follows:

$$SWB_{it} = \alpha + \beta_1 EF_{it-1} + \beta_2 (\Delta EF_{it}) + \beta_4 EF\_gap_{t-1} + \beta_3 X_{it} + \varepsilon_{it} \quad (3)$$

where:  $SWB_{it}$  is subjective well-being used as a measure of happiness for  $i$ th country,  $EF_{it}$  is economic freedom at the level form and  $\Delta EF_{it}$  is the change in economic freedom index,  $X_{it}$  is a vector used for a set of control variables and  $\varepsilon_{it}$  is standard error term.

In equation (3) we use economic freedom at level and change in the explanatory variables. These specifications based on two observations, first is that there are different studies which found that level of economic freedom was not significant in regression analysis (Belasen and Hafer 2013)<sup>2</sup>, and secondly previous literature suggests that changes in economic freedom are more significant and informative than its level (Esposito and Zaleki 1999, Weede and Kampf 2000). Before we proceed to the final estimation of equation (3) we need to determine the period over which we consider the changes in economic freedom occur. There is no theoretical model in our related literature that could guide us to select the time frame to maximize the change in economic freedom to fit the equation so we select 20 years' time frame to measure the change in economic freedom from 1995 to 2014.

In a cross-country analysis of economic freedom and happiness relationship, the relative standing of countries on freedom scale might be more important than the absolute change in economic freedom when knowing that our variables are not changing rapidly over time. Focusing on this point we perform an additional step of estimations replacing the absolute change in economic freedom with its relative version. Particularly the relative version of variables is measured by capturing the distance of standing of a country from the frontier at a given time (year) and the value of frontier in our case is zero. Generally, the measurement of the relative version is:

$$X\_gap_{it} = \frac{X_{leading,t} - X_{it}}{X_{leading,t}} \quad (4)$$

where: "X" represents economic freedom index and its indicators, subscript "i" represents the value of "X" for the country "i" at the time "t" and "leading" represents the country with highest economic freedom at the time "t".

The resulting variable such as  $EF_{gap}$ , serves to show how a relative version of economic freedom in a country could affect the level of SWB or happiness.

#### 3.2. Estimation approach

The results of our study consist of three parts, at first we check the relationship between subjective well-being and economic freedom with control variables, at the second we check the effects of different dimensions of economic freedom with gradually controlling the other variables and the third part consist who benefits more from economic freedom.

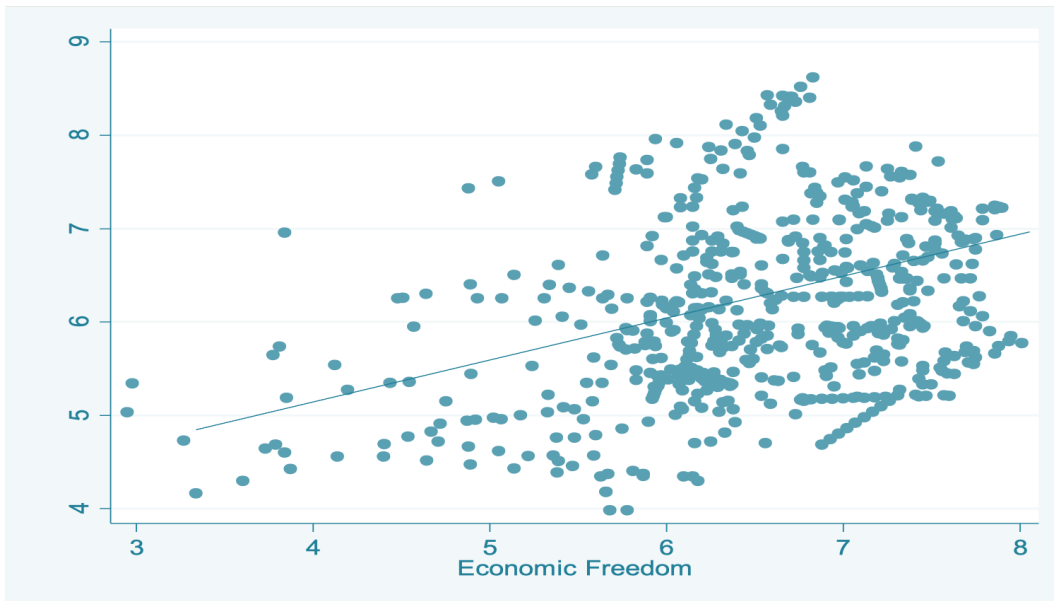
According to our knowledge, most of the studies in previous literature used Pooled OLS regressions for European Value Survey (EVS) and World Value Survey (WVS) and disregarded the panel nature of these both data sources. To remedy the problem of omitted variables biasness we are using panel data set to address our concern in

<sup>2</sup> also justified the use of changes in economic freedom

this regard and we can control the unbiased time-invariant variables. This study uses Hausman specification test and results are in support of the use of Random Effects model in our analysis. Before proceeding to the final interpretation it is necessary to address the problem of serial correlation because it was also disregarded for the panel structure of EVS and WVS both. Distribution of standard errors points toward negative autocorrelation of the error term and first-order AR(1) also shows that there is an only marginal change in coefficients of economic freedom and its robust standard errors.

4. Results and discussion

Figure 1 Bivariate relation between economic freedom and mean value of life satisfaction



Source: World Value Surveys, European Value Survey, Fraser Institute

Figure 1 is showing the scatter plot of change in the mean value of life satisfaction and economic freedom. This plot shows that these two measures are positively related to each other and the robustness of this relationship will be checked by our regression findings in the results section. Table 1 provides the summary statistics of the variables and these statistics are important when we measure or interpret the economic meanings and justification of economic freedom with subjective well-being. We know that reviewers can ask the question about conditional independence and there is always the possibility of omitted variables biasness which may affect the coefficients of our main independent variable. So this study tried to alternate this concern by using a set of economic control variables. Further, we also use four broad regions to test regional contribution to our regression analysis. Regional dummies consist of some distinguishing characteristics which can be used to measure some unobserved effects through controls (Fischer 2010). To maintain the level of clarity we are only displaying the coefficients and significance of control variables and economic freedom measures.

Table 1. Descriptive statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
Mean of life satisfaction	600	6.1435	0.9336	0	10
Believe in GOD	600	5.8083	3.4411	0	10
Social Trust	600	5.209	3.0162	0	10
Govt. Share in Economy (%)	600	12.3193	1.5712	9.1476	15.9600
Human Capital	600	2.5163	0.5608	1.1623	3.5530
Economic Freedom Index	600	6.4807	0.8834	2.95	8.01
Size of Government	600	6.4942	1.0994	2.18	8.79
Property Rights Protection	600	5.1328	0.9612	2.54	7.33
Sound Money	600	7.3098	2.1321	0	9.81

Variables	Obs.	Mean	Std. Dev.	Min	Max
Freedom to Trade Internationally	600	7.0069	1.5975	1.45	9.73
Regulations	600	6.4209	0.9759	2.64	8.33

Source: Author own calculations

Table 2 provides the correlation structure of control variables with the mean value of life satisfaction and economic freedom. We can see that economic freedom along with all control variables is positively correlated with the mean value of life satisfaction. Particularly, economic freedom has a strong positive correlation with GDP per capita and adding GDP per capita into a set of control variables closed a channel through which economic freedom can affect the mean value of life satisfaction and may decrease the biasness of coefficients. As all of the variables in the set of control variables except government share are positively related with economic freedom and mean value of life satisfaction should provide the true causal effects of economic freedom with lower bound *i.e.* the true effect of economic freedom will be larger. Still, the set of control variables might not be complete because of some other omitted variables such as a country's cultural background and environmental factors could also contribute toward subjective well-being or level of happiness.

Table 3 shows the regression results of different models with control variables and different forms of economic freedom to explain the changes in subjective well-being. The regression specification of our models is based on various controls and dummies as stated before and regression results endorsed the conclusion from Figure 1, where the mean value of life satisfaction is positively associated with economic freedom at level form, in change form and relative standing of a country on the scale of economic freedom measurement. The resulted coefficients of economic freedom are not only statistically significant but are also important for economic interpretation.

Table 2. Correlation Structure of variables in baseline specification:

Variables	Satisfaction	BG	ST	GDPPC	Govt. share	HC	EF
Satisfaction	1.0000						
BG	0.2218	1.000					
ST	0.2370	0.0712	1.0000				
GDPPC	0.3178	0.0069	0.0272	1.000			
Govt. Share	0.1554	-0.4460	0.0221	0.7244	1.000		
HC	0.3110	-0.0742	0.0750	0.0217	0.0330	1.000	
EF	0.3429	0.0291	0.0377	0.1097	-0.0977	0.4177	1.000

Source: Author own calculations

Now the question is about the robustness of our control variables whether are they robust or not? Model 1 answers the question that by GDP per capita, govt. share in the economy, human capital, believe in god and social trust to the regression substantially improves the overall fit of the model and in all cases, the explanatory powers of the equations increase by about 10%. The results also show that all of the control variables have positive effects on subjective well-being. The result of model 2 indicates that when we include economic freedom at its level there is a marginal change in the coefficients of all control variables except the coefficient of belief in God which becomes insignificant toward subjective well-being. A one-unit increase in economic freedom measure leads to a 0.2005 points increase in subjective well-being. In contrast to the above findings, the coefficient of belief in God is not significant. The result of model 3 for EF is not much different because the coefficient of change in economic freedom has a positive significant impact on mean value life satisfaction with a p-value of 0.087.

As our second hypothesis based on the relative version of economic freedom measure across the countries so we include all the three measures and results of model 4 show that the value of the coefficients of initial level and change form of economic freedom jumped from 0.2005, 0.2041 to 0.3099 and 0.3435 respectively and level of significance of these both coefficients changed from 5% to 1%. The coefficient of the relative standing of a country or the gap between the standing of countries at economic freedom scale is very small but significant which indicates that a one-point change in economic freedom increases subjective well-being by 0.0110 points with a 5% level of significance. So our results suggest that economic freedom (EF) is robustly significant for the mean value of life satisfaction at a different level of significance in its specification. According to these results, we can reject our first hypothesis (H<sub>1</sub>) at its null that economic freedom (EF) does not contribute to subjective well-being and the same we can reject our second hypothesis (H<sub>2</sub>) at its null that relative standing of a country might not important in cross-country



analysis. However the coefficient of govt. share in GDP remains positively significant with the highest coefficient to the subjective well-being across the regressions is an addition to more income or GDP per capita growth effects. The notion that the partial objective of government intervention is to improve public welfare could be supported by these findings but it doesn't mean that the government will to do so (Tullock 1998).

In Table 3 we established our important finding that aggregate economic freedom index in all of its three forms is positively significant with subjective well-being but we still need to check its dimensions and these all are heterogeneous in their 42 single items.

Table 3. Economic freedom and mean value of life satisfaction: Panel regression with baseline specification using random effects analysis

Dependent Variable: Mean value of life satisfaction. Sample of 30 countries, 1995 - 2014 (annual data)				
Variables	Model 1	Model 2	Model 3	Model 4
$\log Y_{t-1}$	0.1557 (0.0689)**	0.1572 (0.0638)**	0.1437 (0.0653)**	0.2000 (0.2014)
$GovtShare_{t-1}$	0.5596 (0.2146)**	0.4552 (0.2400)*	0.5953 (0.4158)	0.4078 (0.1227)***
$HC_{t-1}$	0.7301 (0.2352)***	0.5176 (0.2311)**	0.8228 (0.2393)***	0.5602 (0.0961)***
$BiG_{t-1}$	0.0110 (0.0051)**	0.0662 (0.0061)***	0.0145 (0.0056)**	0.0081 (0.0059)
$ST_{t-1}$	0.0125 (0.0066)*	0.0102 (0.064)	0.0125 (0.0064)*	0.0086 (0.0043)**
$EF_{t-1}$	---	0.2005 (0.0891)**	---	0.3099 (0.0395)***
$\Delta EF$	---	---	0.2041 (0.0871)**	0.3435 (0.0465)***
$EF\_gap_{t-1}$	---	---	---	0.0110 (0.004)**
Constant	1.9431 (1.140)*	0.7967 (0.122)***	1.8231 (1.1311)*	0.5425 (0.086)***
Regional Dummies	Yes	Yes	Yes	Yes
Time Dummies	Yes	Yes	Yes	Yes
Observations	600	600	600	600
R-sq	0.2452	0.2751	0.2739	0.3469
Wald-chi sq.	42.69 (0.000)	58.90 (0.000)	43.76 (0.000)	299.83 (0.000)

Note: The coefficients are rounded to four decimals. Numbers in parenthesis are corrected standard errors. \*\*\* denotes significance level with  $p < 0.01$ , \*\* denotes significance level with  $p < 0.05$  and \*denotes significance level with  $p < 0.10$ .

Although some of them are clear in interpretations such as legal system and property rights and freedom to trade internationally and can also be easily measured while the rest of those such as the size of government and its dimensions are quite controversial (De Haan and Sterm 2000). So we are going to add some important information to make it possible for the reader to understand these individual dimensions easily and to identify that which of them most relevant with the mean value of life satisfaction as a measure of subjective well-being. Our previous findings exert that economic freedom has a positive significant impact on subjective well-being but this relationship is straightforward. According to Gwartney (2009) that components of economic freedom measure work like a team and if any one of them is absent or inefficient the overall significance is undermined. So to interpret an insignificant component or dimension of economic freedom is more important and this trend might have several meanings or ways of interpretation. One of the contributions of our study is also to examine all those possible relations or meaning a dimension has when it is not in the overall domain of aggregate economic freedom index.

Putting all of the components of economic freedom in a single regression equation will not make any sense because the correlation between these dimensions is high, so we are estimating our regression equations by putting the individual dimension in our regression equation with controls one at a time. To go with lucidity, we are presenting the coefficients and level of significance of each dimension of the economic freedom index in Table 4. Previously it is

concluded that economic freedom is consistently significant in its all three forms and increases the subjective well-being in the selected panel of countries and these results are in line with Ovaska and Takshima (2006) and Belasen and Hafer (2013).

Table 4. Correlation structure of dimensions of economic freedom

	Satis	SG	PRP	SM	TF	Reg
Satis	1.000					
SG	0.1199	1.000				
PRP	0.0961	-0.2463	1.000			
SM	0.3803	0.1945	0.3203	1.000		
TF	0.2852	0.1142	0.5284	0.5143	1.000	
Reg	0.1603	0.2869	0.2655	0.6044	0.5236	1.000

Source: Author's own calculations

The results in Table 5 show that the coefficients of all dimensions are positively significant for the mean value of life satisfaction *i.e.* subjective well-being. The purpose of the dimensional specification of economic freedom is to go into deep to find some interesting correlations between economic freedom and subjective well-being. It will also reveal that the measure of economic freedom by the Fraser Institute explains the factors that significantly contribute to the subjective well-being. The first dimension of economic freedom is government size and its coefficient is lowest among all dimensions with positive significance as theory suggested. De Haan and Sturm (2000) argued that the inclusion of taxation into government size might not be the right measure and this could be the possible reasoning of the lowest contribution of this dimension to the subjective well-being. Government intervention itself may be good for the well-being but its measure might not be right. As we earlier stated that the coefficient of government share in a percentage of GDP was the second-highest contributor to the subjective well-being and was robustly significant which means that government involvement in economic activities contributes significantly to the level of happiness/ subjective well-being across the developing countries. The 2<sup>nd</sup> dimension of economic freedom is Legal System and Property Rights, this dimension seems to capture the factors which are most relevant with subjective well-being. With a strong legal system and property rights protection, commercial agreements are secure. The individual can enter mutually beneficial agreements because of an enforcement mechanism behind their commitments with each other. It is easy for them to attain a level of material comfort in the presence of property rights protection. Our findings support that if there is a provision of protective rights in developing countries it will contribute toward subjective well-being.

Table 5. Economic freedom and mean value of life satisfaction: panel regression analysis using five different dimensions of economic freedom

Dependent Variable: Mean value of life satisfaction. Sample of 30 countries, 1995-2014 (annual data)					
Variables	1	2	3	4	5
$SG_{t-1}$	0.0585 (0.03128)*				
$PRP_{t-1}$		0.0611 (0.0302)**			
$SM_{t-1}$			-0.1145 (0.0167)***		
$TF_{t-1}$				0.0897 (0.0348)**	
$Reg_{t-1}$					0.0946 (0.0412)**
Constants	4.6358 (0.3602)***	2.2671 (0.1025)***	3.9377 (0.2118)***	1.6104 (0.0983)***	6.2323 (0.5302)***
Observations	600	600	600	600	600
R-sq.	0.1889	0.1263	0.1686	0.2143	0.1802
Wald Test	131.00 (0.000)	97.00 (0.000)	113.00 (0.000)	223.00 (0.000)	167.00 (0.000)

Note: The coefficients are rounded to four decimals. Numbers in parenthesis are corrected standard errors. \*\*\* denotes significance level with  $p < 0.01$ , \*\* denotes significance level with  $p < 0.05$  and \* denotes significance level with  $p < 0.10$ .

The coefficient of sound money is the only one which is negatively significant among all of the dimensions. Gehring (2013) already found a negative significant effect of inflation on subjective well-being. Though our findings are not conclusive and future researchers might explain more briefly the question of whether sound money has a positive or negative effect on subjective well-being. Freedom to trade internationally is one of the few dimensions where economists agree on its beneficial effects for subjective well-being. In our results its coefficient is positive significant to the subjective well-being, supporting the argument that trade freedom usually boosts the wealth and prosperity among the nations. As a major share of the population of these countries is of young people and Gehring (2013) argued that younger people more concerned with a variety of products as compare to old people. Following the establishment of WTO in 1995 there was a steady decrease in trade barriers which significantly contributed toward subjective well-being in developing countries. The last dimension of economic freedom is regulations and it has the largest impact on subjective well-being in selected countries. There are different thoughts and controversies about regulations in economic literature. Regulation index created by Fraser Institute is based on three types of regulations *i.e.* credit market regulations, labor market regulations and business regulations. Our findings are in line with the study of Farhadi *et al.* (2015) who argued that regulation of credit market, business market, and labor market increases the competition and enables the economies to make an efficient allocation of resources that can foster the growth and bring prosperity among the nations.

In Table 6 we present a sensitivity analysis of economic freedom and its dimensions where we examine the effects of these measures on subjective well-being in developing countries. We split our sample into three different sets on the bases of per capita income level of the countries *i.e.*:

- lower-middle-income countries;
- upper-middle-income countries;
- high-income countries following the assessment of World Bank (2015).

After splitting, our sample size for each set of countries is reduced and the result indicates a significant change and difference in the coefficient of each variable however high-income countries do significantly differ for most of the dimension. The effect of economic freedom and its two individual dimensions such as government size and legal system and property rights on subjective well-being is large in high-income countries as compared to the rest of the sets. These findings are in line with the study of Bjornskov *et al.* (2010) and they argued that the societies with high income usually appreciate and endorse the decisions and values of judicial and democratic institutions without considering their material well-being.

Table 6. Economic freedom and mean value of life satisfaction: Panel regression analysis on the basis of income level of the countries

Dependent Variable: Mean value of life satisfaction			
Variables	Lower-Middle-Income Countries	Upper-Middle-Income Countries	High-Income Countries
$EF_{t-1}$	0.1325 (0.0768)*	0.2221 (0.0435)***	0.5597 (0.0802)***
$SG_{t-1}$	0.0481 (0.0114)***	0.0158 (0.0375)	0.1546 (0.0587)**
$PRP_{t-1}$	0.0047 (0.0741)	0.1138 (0.0472)**	0.2347 (0.0839)**
$SM_{t-1}$	-0.0517 (0.0277)*	-0.1194 (0.0181)***	0.1566 (0.0371)***
$TF_{t-1}$	0.3460 (0.0894)***	0.2323 (0.0455)***	0.1032 (0.0468)*
$Reg_{t-1}$	-0.1776 (0.0872)**	0.1791 (0.0471)***	0.0255 (0.0879)
Observations	140	340	120
Countries	7	17	6
Method	RE	RE	FE

Note: The coefficients are rounded to four decimals. Numbers in parenthesis are corrected standard errors. \*\*\* denotes significance level with  $p < 0.01$ , \*\* denotes significance level with  $p < 0.05$  and \*denotes significance level with  $p < 0.10$ .

The coefficient of Sound Money is negatively significant in both lower-middle-income and middle-income countries which mean that citizens of countries value the access to sound money and these results are in line with Nadeem *et al.* (2019) where they argued that monetary freedom has a negative impact on growth and social welfare in the cross country analysis. For the high-income countries, the coefficient is unexpectedly positively significant and the findings are in support of the argument that in high-income countries, citizens don't care about money growth or inflation (Gehring 2013). As earlier, we stated that regulation is the most controversial dimension among the theories. The coefficient of regulation is negatively significant for lower-middle-income and middle-income countries and it is not significant for high-income countries that is not according to our theoretical modeling. According to regulatory theories, the negative effect of regulations is stronger in poor countries. Weaker structure of regulations and a lower rate of return in markets are exploited by the interest group and rent-seekers which lead to the adverse effects of these laps on the individual level of income and subjective well-being of poor societies. The coefficient of overall economic freedom is positively significant for all three sets of countries. In contrast to the findings of Bjornskov *et al.* (2000) and Gehring (2013), the effect of economic freedom remains significant across the equations in three sets of data. Beyond the specification of countries, economic freedom seems beneficial for subjective well-being across the nations.

## 5. Contribution of the study

The present study contributes to the SWB literature in two ways. First, we build on recent efforts by Ali *et al.*, (2018) to measure the relative version of the social capabilities of a country. We use their relative version of social capabilities to more comprehensively measure the institutional capabilities of a country. Although the relative version, initial level and change variable of economic freedom are highly correlated we feel that our study allows us to use these variables together to make broader inferences about institutional capabilities. Second, we assess the impact of change in economic freedom on SWB by splitting our panel into lower-middle-income, higher-middle income and higher-income countries. We draw on and complement the literature that uses country-level data to analyze the link between institutional capabilities and subject well-being.

Our contributions can be understood at two levels: the change and relative version of economic freedom. Below explore these two contributions. For the relative version of economic freedom, we realize that political structure, culture, and traditions have an important role to play in this regard. We might argue that regional factors concerning its political and societal landscape may predestine a country. Nevertheless, democratic governments are held accountable for social well-being. So the government officials, especially in democratic countries, should focus to enhance the capabilities of economic and legal institutions without any political affiliation. For the change in economic freedom, the implication is that policymakers should focus on economic freedom infrastructure. As economic freedom indicates the extent of the capabilities of economic and legal institutions depends on:

- size of government;
- legal structure and property rights protection;
- access to sound money;
- barriers to trade internationally;
- regulatory barriers.

By taking some steps to create and shore up the capabilities of institutions supporting economic freedom (*e.g.* judicial independence is necessary for property rights protection) the conditions can be created for bearing the fruits of economic freedom for the well-being of the society. Our contributions do not speak to the government officials only but the concerned citizens can use our findings to lobby to enhance institutional capabilities by articulating why these institutions are useful for the subjective well-being of the society in developing countries.

## Conclusion

In this study, we tested the relationship between economic freedom, its dimension and subjective well-being for the panel of 30 developing countries. Overall the empirical findings suggest that economic freedom helps to explain the observed level of subjective well-being in selected countries. Using a panel data approach, we have shown that the significance of the coefficients of economic freedom and its dimensions for subjective well-being is not due to serial correlation or omitted variables bias. By choosing a set of control variables we closed many channels via someone could assume a positive effect, for example, controlling the level of income as most of the studies argued about the

significance of income for subjective well-being. Our results suggest that an increase in economic freedom at its initial level, with change and relative version and its dimensions are positively correlated with the mean value of life satisfaction which we are using as a measure of subjective well-being. By expanding our regression equation with the inclusion of economic control variables and time and regional dummies tempered this relationship to some extent but there is no change in overall results and we continued with the same findings to conclude our discussion.

The findings based on regional dummies suggest some more aspects of the clustering of economic freedom, its dimension, and subjective well-being and it needs further analysis. As our objective was to develop the institutional origin of cross-country subjective well-being and to investigate the impact of economic freedom and its dimension on subjective well-being for 30 developing countries for the period of 1995-2014 using 10-scale numeral mean value of life satisfaction score from World Value Survey (WVS) and European Value Survey (EVS). Further, the measure of economic freedom developed by Fraser Institute is based on the factors which truly related to subjective well-being. It is noted that the last dimension of economic freedom, regulations exerts adverse effects on subjective well-being in previous studies *i.e.* Gehring (2013). However, it has a positive significant impact on subjective well-being in our case and it is beyond the scope of our study to examine the channels and reasons for these findings in proper detail. So it needs to evaluate carefully the pros and cons of new regulations in the market. With a negative coefficient of sound money, we can interpret the findings in a way that higher inflation and monetary growth are not a favorable option for a national happiness or subjective well-being for developing countries. The discussion and interpretation of the regional dummies are beyond of our study. However, the results based on regional dummies provide an avenue for the future researchers to employ some spatial econometric models to examine the relationship between economic freedom, its dimension and subjective well-being across the regions. This would relate to the study of Clark *et al.* (2016) which used regional dummies for income-happiness relation but alternatively one can rely on spatial econometric techniques to omit the use of regional dummies. For example, LePage's (1997) used a spatial autocorrelation method to replace regional dummies at the state level. However, the findings of our study should possess a strong foundation of institutions-well-being nexus regardless of the approach used for this purpose to follow up.

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## APPENDIX A:

### Area and components of the economic freedom of the world index developed by Fraser institute

#### 1. Size of government: expenditures, taxes and enterprises

- a) General government consumption spending as a percentage of total consumption;
- b) Transfer and subsidies as a percentage of GDP;
- c) Top marginal tax rate (and income threshold to which it applies).

#### 2. Legal structure and security of property rights

- a) Judicial independence: The Judiciary is independent and not subject to interference by the government or parties in disputes (GCR);
- b) Impartial courts: A trusted legal framework exists for private business to challenge the legality of government actions or regulation (GCR);
- c) Protection of intellectual property (GCR);
- d) Military interference in rule of law and the political process (ICRG);
- e) Integrity of the legal system (ICRG).

#### 3. Access to sound money

- a) Average annual growth of the money supply in the last five years minus average annual growth real GDP in the last ten years;
- b) Standard inflation variability in the last five years;
- c) Recent inflation rate;
- d) Freedom to own foreign currency bank accounts domestically and abroad.

#### 4. Freedom to trade internationally

- a) Taxes on international trade:
  - Revenue from taxes on international trade as a percentage of exports plus imports;
  - Mean tariff rate;
  - Standard deviation of tariff rate.
- b) Regulatory trade barriers:
  - Hidden imports barriers: No barriers other than published tariffs and quotas (GCR);
  - Costs of importing: The combined effect of imports tariffs, license fees, bank fees, and the time required for the administrative red-tap raises costs of importing equipment by (10=10% or less, 0=more than 50%) (GCR);
- c) Actual size of trade sector compared to expected size;
- d) Difference between official exchange rate and black market rate;
- e) International capital market controls:
  - Access of citizens to foreign capital markets and foreign access to domestic capital markets (GCR);
  - Restrictions on the freedom of citizens to engage in capital market exchange with foreigners-index of capital controls among 13 IMP categories.



## 5. Regulation of credit, labor and business

### a) Credit markets regulations:

- Ownership of banks: Percentage of deposits held in privately owned banks;
- Competition: Domestic banks face competition from foreign banks (GCR);
- Extension of credit: Percentage of credit extended to private sector;
- Avoidance of interest rate controls and regulations that lead to negative real interest rates;
- Interest rate controls: Interest rate controls on bank deposits and/or loans are freely determined by the markets (GCR);

### b) Labor market regulations:

- Impact of minimum wage: The minimum wage, set by law, has little impact on wages because it is too low or not obeyed (GCR);
- Hiring and firing practices: Hiring and firing practices of companies are determined by private contract (GCR);
- Share of labor force whose wages are set by centralized collective bargaining (GCR);
- Unemployment benefits: The unemployment benefits system preserve the incentive to work (GCR);
- Use of conscripts to obtain military personal.

### c) Business regulations:

- Practice controls: Extent to which businesses are free to their own prices;
- Administrative conditions and new businesses: Administrative procedures are an important obstacle to starting a new business (GCR);
- Time with government bureaucracy: Senior management spends a substantial amount of time dealing with government bureaucracy (GCR);
- Starting a new business: Starting a new business is generally easy (GCR).

## APPENDIX B

## Variables description and data sources

Variables	Data Description	Source
Mean of life satisfaction	How satisfied are you with your life? Scale 0-10	World Value Surveys & European Value Surveys
Believe in god	How important is god in your life? Scale 0-10	World Value Surveys & European Value Surveys
Social trust	Most people can be trusted? Scale 0-10	World Value Surveys & European Value Surveys
Govt. share in economy (%)	Share of general government spending in GDP	PWT-9.0
Human capital	Human capital index, based on years of schooling and returns to education	PWT-9.0
Economic Freedom Index	Economic freedom of the world index	Fraser Institute
Size of govt. (SG)	For detail description see Appendix A	Fraser Institute
PRP	For detail description see Appendix A	Fraser Institute
Sound money (SM)	For detail description see Appendix A	Fraser Institute
Freedom to trade internationally	For detail description see Appendix A	Fraser Institute
Regulations	For detail description see Appendix A	Fraser Institute

## APPENDIX C

## Names of the countries under analysis

Lower-middle income countries	Upper-middle income countries	Higher-middle income countries
1. Armenia;	1. Argentina;	1. Chile;
2. Egypt;	2. Azerbaijan;	2. Estonia;
3. Georgia;	3. Brazil;	3. Poland;
4. India;	4. Bulgaria;	4. Russia;
5. Nigeria;	5. China;	5. Slovakia;
6. Pakistan;	6. Columbia;	6. Taiwan.
7. Zimbabwe.	7. Hungary;	
	8. Macedonia;	
	9. Mexico;	
	10. Morocco;	
	11. Peru;	
	12. Philippine;	
	13. Romania;	
	14. South Africa;	
	15. Turkey;	
	16. Ukraine;	
	17. Uruguay.	

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