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Journal of Applied Economic Sciences

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TIME SERIES MODELS AND COINTEGRATION IN STOCK PORTFOLIO SELECTION

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Abstract:

Cointegration has become the prevalent statistical tool in applied economics. It is a powerful technique for investigating long term dependence in multivariate time series. Our paper describes a specific portfolio selection method based on cointegration. We construct cointegration model in two stages: at first we examines the association in a long term equilibrium between the prices of a set of financial assets, and in the second stage we use a dynamic model of correlation, called an error correction model based on linear regression analysis of returns. We considered an allocation into portfolio consisting of Dow Jones Industrial Average components and thereafter we compare long term return and risk profile of portfolio focus on cointegration selection process and index DJIA. The cointegration technique enabled us to use long calibration period and provided that portfolio weights do not change too much over time and outperform the index DJIA in post-sample performance measurement.

Keywords: portfolio selection, cointegration, portfolio risk and return, index tracking, linear regression.

JEL Classification: C51, C52, G12, G32

1. Introduction

The conventional construction of a financial portfolio is based on an analysis of the correlation structure among the particular financial assets involved in the portfolio. It was Harry Max Markowitz (1952) in early 1950's who published a revolutionary paper on how does one select an efficient set of risky investment or so called efficient frontier. This theory provides the first quantitative view of portfolios variance, where co-movements in securities returns are considered. So, the variance of portfolios is not a simple product of the particular investment proportion and their variances. Instead of it one has to consider covariance structure implicitly involved in multi-variate distribution of securities returns. Almost three decades ago the general approach RiskMetrics was developed by J.P. Morgan during the late 1980's and has been commonly applied by financial market participants for more than two decades. Unfortunately the concept lacks of accuracy if the correlation structure varying in time. From this perspective the traditional portfolio needs rebalance repeatedly, what could increase the cost structure of the portfolio dramatically. In general the use of the traditional concept is delimited and depends on the level of change within the portfolio volatility.

While the traditional approach considers historical time series returns of the selected set of financial assets and their replication against the return of a particular index the cointegration analysis uses assets' time series appearing and behaving as random processes or processes of the so-called random walk. In our study we use the second mentioned concept, cointegration. The classical papers on cointegration are by Granger (1986) and Engle and Granger (1987).

The cointegration is based on the long-term relationship between time series. One can consider the cointegration, if there is such linear combination of the non-stationary time series that is stationary. The passive index tracking strategy tries to achieve equal return as well as the underlying index, and concurrently tries to diminish the volatility of the tracking error, thus a difference between the portfolio return and underlying index.

The paper is divided as follows: at the beginning we briefly start with an overview of time series stationarity, a specific assumption that is expected to be fulfilled for applying the cointegration approach. A difference between correlation and cointegration is being explained in a brief form. Further we describe cointegration analysis and the possible fields and forms of its applicability. All this effort is summarized in an overview the theory and the state of the art. Engle-Granger method has been applied as a technical part of our research methodology. We considered an allocation into portfolios consisting of Dow Jones Industrial Average (DJIA) components. At first we describe

methodology with a description of data and later the further attributes for asset allocation are specified. Beyond the current research in this field we consider particular modifications of key parameters and them sensibility change in a form of different number of stocks, reselection interval, calibration period and strategy used as well as level of transaction expenses. At the end the discussion is provided.

2. Literature review

Passive and active equity portfolio management style is usually discussed and described in economics literature. The crucial phase in the investment process is allocation what for equity style portfolios means stock picking or stock selection. It was Harry M. Markowitz (1952, 1959) who made the first quantitative and empirical contribution to portfolio selection. According to Reilly and Brown (2012) no middle ground exists between active and passive equity management strategies. They also argue that "hybrid" active/passive equity portfolio management style exists, in a form of enhanced indexing, but such styles are variations of active management philosophies.

Focusing on passive equity portfolio management means a long-term buy-and-hold strategy. Very often some authors like Gibson (2013) or Nofsinger (2013) referee about indexing strategy, because of the goal of tracking an index. In this context only occasional rebalancing is needed, specifically because dividends and their reinvesting, stocks merge or change in the index construction. In traditional literature one can find three basic techniques for constructing a passive index portfolio – full replication, sampling, and quadratic optimization or programming. Full replication technique helps ensure close tracking, but it may be suboptimal because of transaction cost connecting with purchase of many securities and dividend reinvestments. With sampling technique we need to buy a representative sample of stacks that comprise the benchmark index. The last passive technique is quadratic optimization or quadratic programming based on historical information on price changes and correlations between securities as inputs to a computer program that determines the composition of a portfolio that minimize tracking error with the benchmark. This technique lack of accuracy because it relies on historical price changes and correlation. According to Alexander (2008) correlation reflects co-movements in returns, which are liable to great instabilities over time. Returns have 'no memory' of a trend so correlation is intrinsically a short term measure. As she further explains that is why portfolios that have allocations based on a correlation matrix commonly require frequent rebalancing and long-short strategies that are based only on correlations cannot guarantee long term performance because there is no mechanism to ensure the reversion of long and short portfolios. That's the reason why Alexander (1999), Alexander and Dimitriu (2005) and Dunis and Ho (2005) proposed to use cointegration analysis as a sound statistical methodology for modelling the long term equilibrium.

In general we can say cointegration and correlation are related but different concepts. High correlation does not automatically imply high correlation nor vice versa. If there is cointegration or not, high correlation can occur. But to distinguish both terms we need to note that correlation tells us nothing about the long term relationship or behaviour between two assets. So correlation is not adequate measure over long periods of time. Correlation only reflects co-movements in returns, which have no 'memory' of a trend, so is intrinsically a short term measure.

As we already mentioned in our papers in Glova (2013a, b), the co-movements between stocks can be due to a single or multiple indices. So the correlation or covariance structure of security returns might be obtained by relating the return on a stock to the return on a stock market index or other non-market indices. Unfortunately as mentioned by Alexander (2008) so created portfolios require frequent rebalancing because there is nothing to prevent the tracking error from behaving in the unpredictable manner of random walk.

To conclude, since correlation tells us nothing about long term performance there is a need to augment standard risk-return modelling methodologies to consider long term trends in prices. Therefore as mentioned by Alexander and Dimitriu (2005) portfolio management strategies based on cointegrated financial assets should be more effective in the long term.

3. Data and methodology

We use the financial data on the DJIA to construct our own portfolio based on cointegration. We preselected 15 different stocks with the highest Pearson correlation coefficient with the DJIA. Time period spreads from December 29, 2000 till December 31, 2013 and it is based on daily close prices of the selected stocks. Data have been downloaded from Yahoo Finance financial portal. The

preselected stocks are listed and highlighted with bold and underlined in Table 1. We used ticker symbols to identify the particular stock within DJIA.

Table 1 - Pre-selection process based on correlation coefficient

Stock – Ticker	Correlation coefficient		Correlation coefficient		Correlation coefficient
MMM	**0,934253**	GE	-0,00933	**NKE**	**0,955621**
AXP	0,867675	GS	0,645468	PFE	0,183908
T	0,888639	HD	0,75425	**PG**	**0,940315**
BA	**0,909297**	INTC	0,408917	**TRV**	**0,960777**
CAT	**0,907977**	IBM	0,883226	UNH	0,794894
CVX	**0,96574**	**JNJ**	**0,929247**	**UTX**	**0,982367**
CSCO	0,406203	JPM	0,879797	**VZ**	**0,892479**
KO	**0,922822**	**MCD**	**0,917502**	WMT	0,777172
DD	**0,90675**	MRK	0,497268	**DIS**	**0,960382**
XOM	**0,918978**	MSFT	0,863137	HPQ	0,31728

*Source***:** own calculation based on the data from Yahoo Finance

The existence of long term equilibrium relationship between log prices that are part of our portfolio and log values of stock index is a pre-condition for index tracking methodology. It is also necessary that all variables in regression are integrated processes with same order of integration. We tested this assumption based on Augmented Dickey Fuller test. In Table 2 are summarized test statistics and some selected data from descriptive statistics.

The cointegration-based index, that employs the Engle-Granger methodology, was introduced and developed by Alexander and Dimitriu (2005) and by Dunis and Ho (2005). According to the methodology the log of the current weighted index price I_t is the dependent variable and the log of the stock prices P_{kt} are the independent variables

$$\ln(I_t) = \alpha + \sum_{k=1}^{n} \beta_k \ln(P_{kt}) + \varepsilon_t \tag{1}$$

If the number of stocks in the portfolio is sufficient large, the cointegration optimal portfolio has weights

$$\beta^* = \left(\sum_{k=1}^{n} \hat{\beta}_k\right)^{-1} (\hat{\beta}_1, \cdots, \hat{\beta}_n)' \tag{2}$$

Table 2 - Test statistics and selected data from descriptive statistics

	adf stat	p-value	diff adf stat	diff p-value	mean	median	sd
DJIA	-2.5656	0.3389	-15.4058	<0.01	7,116151	7,10273	0,286637
MMM	-2.0358	0.5632	-14.9765	<0.01	4,171923	4,168472	0,269858
BA	-1.7952	0.6651	-15.6069	<0.01	4,030695	3,949168	0,40381
CAT	-2.4029	0.4078	-14.6204	<0.01	3,95182	3,800438	0,57174
CVX	-2.7732	0.251	-16.5604	<0.01	4,053696	3,978853	0,50123
KO	-2.8145	0.2335	-15.8045	<0.01	2,9877	3,091706	0,293619
DD	-2.3179	0.4437	-15.0284	<0.01	3,460723	3,522741	0,252424

XOM	-2.1475	0.5159	-16.0362	<0.01	4,084463	3,964202	0,39877
JNJ	-2.4047	0.407	-15.4202	<0.01	3,923952	3,92214	0,217917
MCD	-3.4879	0.04343	-15.0976	<0.01	3,701549	3,625511	0,625699
NKE	-3.4485	0.04723	-15.6388	<0.01	3,154444	3,14433	0,574842
PG	-2.9542	0.1743	-15.2178	<0.01	3,912623	3,848129	0,294671
TRV	-2.9786	0.164	-15.9509	<0.01	3,626738	3,691693	0,326625
UTX	-2.9357	0.1822	-15.6732	<0.01	3,968592	3,893412	0,417218
VZ	-2.3703	0.4216	-15.4705	<0.01	3,162517	3,236234	0,278395
DIS	-2.3524	0.4291	-15.5949	<0.01	3,282789	3,313332	0,378482

Source: own calculation

4 Model fitting and diagnostic

We apply OLS regression and estimate the coefficients in such a way as to minimize the variance of the residuals. The tracking error has a minimum variance property and is mean reverting process. Using 15 pre-selected stocks and perform an Engle-Granger regression of the form (1) we achieved the regression results summarized in Table 3.

Table 3 - Regression results

REGRESSION STATISTICS			
Multiple R	0,996912		
R Square	0,993834		
Adjusted R Square	0,993806		
Standard Error	0,022563		
Observations	3269		
ANOVA			
	df	*SS*	*MS*	*F*
Regression	15	266,9267	17,79511	34955,53
Residual	3253	1,656033	0,000509	
Total	3268	268,5827		

Source: own calculation

After fitting regression function we tested the residuals for stationarity, and seeing that are stationary we normalize the coefficient estimates as in (2) so that they sum to one. The optimal weights on the cointegration tracking portfolio are listed in Table 5.

Table 4 - ADF and KPPS tests on residuals from Engle-Granger regression

	ADF stat	p-value	KPPS	p-value
Residuals	-5.2174	<0.01	0.33	>0.1

Source: own calculation

An augmented Dickey-Fuller (ADF) test and Kwiatkowski-Phillips-Schmidt-Shin (KPPS) test on residuals from Engle-Granger regression of log DJIA on log stock prices had been used to proof the stationarity. The regression residuals are indeed stationary, see Table 4. Hence, the portfolio is cointegrated with the index the optimal portfolio weights had been obtained using (2) and the results are shown in Table 5.

Table 5 - Portfolio optimal weights using Engle-Granger regression

	COEFFICIENT	PORTFOLIO WEIGHT	
Intercept	4,021658462		
MMM	0,018103843	0,021120614	2,11 %
BA	0,111003924	0,129501286	**12,95 %**
CAT	0,050339613	0,058728055	5,87 %
CVX	-0,129850495	-0,151488393	**-15,15 %**
KO	0,050956778	0,059448063	5,94 %
DD	0,087693655	0,102306663	**10,23 %**
XOM	0,16400877	0,191338701	19,13 %
JNJ	-0,035757506	-0,04171603	**-4,17 %**
MCD	0,022153456	0,025845042	2,58 %
NKE	0,039216491	0,045751409	**4,58 %**
PG	0,020871154	0,024349061	2,43 %
TRV	0,187831383	0,219131043	**21,91 %**
UTX	0,108292106	0,126337579	12,63 %
VZ	0,092465071	0,107873173	**10,79 %**
DIS	0,069836405	0,081473734	8,15 %
Total	0,857164648	1	100%

*Source***:** own calculation

5. Comparision of return and risk characteristics of constructetd portfolio and DJIA

In the following Table 6 we can see DJIA and portfolio characteristics for time period spreads from December 29, 2000 till December 31, 2013. We wanted to compare values of constructed portfolio and DJIA using daily values of portfolio and index. We employed following equation to calculate data and so enable the comparison:

$$\pi_{T+x} = \pi_T \sum_{k=1}^{n} \frac{w_{k,T}}{P_{k,T}} \cdot P_{k,T+x} \tag{3}$$

where π_T = value of portfolio at time T, $w_{k,T}$ = weights of particulars stocks at time T, $P_{k,T}$ = closing prices of particulars stocks at time T, x = shift in time.

Table 6 DJIA and portfolio characteristics

		DJIA	PORTFOLIO
Return	$E(R_x)$	0,000262	0,000302
Variance	σ^2_x	0,000161	0,000185
St. Deviation	σ_x	0,012682	0,013619
Correlation	$\rho_{x,y}$	0,935946	

*Source***:** own calculation

Our cointegration-based index tracking model uses a sufficiently long calibration period and so is capable of producing optimal portfolios that outperform the index DJIA in post-sample performance measurement. In Figure 1 we see the DJIA downturn in October 9, 2002, where the

market had declined 38% since January 14, 2000. The values of DJIA had faced the financial downturn in 2007 and following Great Recession lasting from 2007 till the beginning of 2010. From these perspectives it is clearly visible that cointegration-based tracker outperforms the index quite spectacularly even if the index declines sharply after a period of stability.
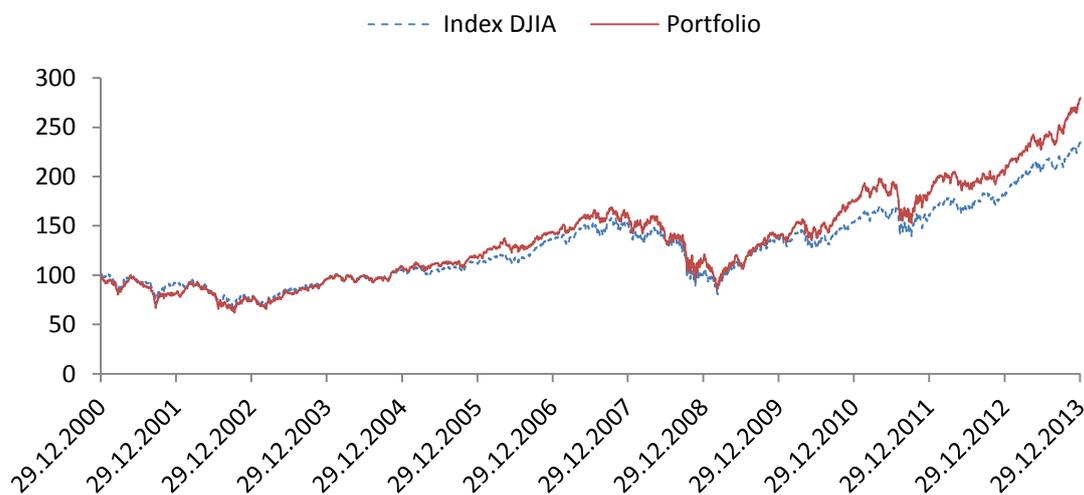
Figure 1 - Comparison of index and portfolio values (base period value of 100). Source: own calculation**.**

Conclusion

In last two decades cointegration has become the prevalent statistical tool in applied economics. It is a powerful technique for investigating long term dependence in multivariate time series because it provides a methodology for modelling the long term equilibrium and the short term dynamics in one concept. Because of limitation of correlation, we pointed out the difference between cointegration and correlation. We have also explained why correlation fails, specifically in long term perspective.We demonstrate the applicability of the concept within cointegration-based index tracking model using real data of the index DJIA and its components. The cointegration technique enabled us to use long calibration period and provided that portfolio weights do not change too much over time and outperform the index DJIA in post-sample performance measurement. So we could construct a sufficiently large and well diversified stock portfolios outperforming better than the index itself. Compared to traditional correlation-based index tracking portfolio strategy we do not need rebalance our portfolios so frequently, what also help us diminish our transaction cost significantly.

Acknowledgement

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THE IMPACT OF INNOVATION ORIENTATION ON MARKET PERFORMANCE OF ROMANIAN B2B FIRMS

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Abstract

Literature examines the impact of innovation orientation on firms' performance and often demonstrates a direct and positive relationship between the two concepts. However, few empirical studies are analyzing the relationship between innovation orientation and market performance constructs, one of the most important being customer satisfaction. This paper presents a review of innovation orientation concept and empirically investigates the relationship between innovation orientation and customer satisfaction using data from 95 companies in Romania working mainly in the B2B domain. The results confirm previous exploratory research, namely that there is a direct, positive and strong link between innovation orientation and customer satisfaction within Romanian B2B companies.

Keywords: Innovation orientation, innovation, performance, customer satisfaction, innovation in Romania.

JEL Classification: M21, O31, M00

1. Introduction

Innovation is currently one of the most important problems of organizations.

Carr (1999) states that firms innovate on many levels such as those related to business models, products, services, processes and distribution channels in order to maintain or conquest new markets, distanced themselves from the competition and ensure a long-term survival and growth particularly when they activate in complex and extremely turbulent environments (Freeman, 1994; Lawless and Anderson, 1996).

In the literature (Freeman 1994; Miles and Snow 1978; Van de Ven *et al.* 1999) a special attention has been given to the innovation types and diffusion, without taking into account the organizational innovation process as a permanent and major objective. Regarding this situation Tushman (1997) reported that innovation itself is not necessarily the key to long term success of firms. Instead, a company's success is based on innovation in the global orientation of the firm. This orientation produces the continuous innovation capabilities with multiple effects on the performance both inside and outside the organization.

This paper aims to present the possible effects resulting from the adoption by the organizations of the strategic orientation towards innovation and empirically demonstrate the positive effect of innovation orientation on customer satisfaction within Romanian companies.

2. The concept of innovation orientation

Manu (1992) defined innovation orientation as all innovation programs within an organization. He says that this type of orientation has a strategic nature as gives companies a way to approach the markets. Manu and Siriam (1996) conceptualized innovation orientation as a multi-component construct containing the introduction of new products, research and development expenses related to the order of entry on the market.

Amabile (1997) stated that the most important elements of innovation orientation are represented by a certain value attached to creativity and innovation in general, an orientation toward risk, a sense of pride within the organization members, their enthusiasm about what they can do and by an offensive strategy of assuming the future.

Berthon, Hulber and Pitt (1999) define innovation orientation as related to those companies who devote their energies towards inventing and perfecting superior products. This conceptualization incorporates both approaches on innovation orientation namely openness to innovation (Zaltman, Duncan and Holbek 1973) and the capability for innovation (Burns and Stalker 1977).

Worren, Moore and Cardona (2002) conceptualized innovation oriented as being the link between product modularity and an organization strategic intent to develop new products or enter new markets with its existing products.

Given the broad scope of innovation and the increased complexity as a result of the deepening of the conceptual basis, Siguaw, Simpson, and Enz (2006) almost 10 years after the first conceptualization of the orientation, say that the typology proposed by Manu and Siriam fails to consider both organizational beliefs or culture and the organization knowledge structure that could promote or inhibit innovation of a company.

In an attempt to bring together and complete the conceptual shortcomings of the literature and the lack of consensus, Siguaw, Simpson, and Enz (2006) define the innovation orientation as a multi-dimensional knowledge structure consisting of learning philosophy, strategic direction and trans-functioning beliefs of a company that guides and directs all organizational strategies and actions, including also those embedded in formal and informal behaviors, skills and business processes to promote innovative thinking and facilitate the development, evolution and implementation of innovations.

This definition conceptualizes innovation orientation as a set of understandings about the innovation made in the structure of the firm knowledge that influence organizational activities, but not as a specific set of normative behaviors (Siguaw, Simpson, and Enz 2006).

The approach proposed by Siguaw, Simopson and Enz (2006) separates the organizational beliefs of effective actions by considering innovation orientation as a structure of knowledge rather than an organizational culture or a mixture of rules and behaviors. In this expansive approach, the knowledge capital of an organization is constantly enriched to identify the next steps for maintaining innovativeness (Martin and Salomon 2003).

The innovation orientation, in the formula proposed by the authors, has academic support that comes from emerging researches that suggest the importance of collective understandings which direct or guide the organization and its employees in order to engage in activities designed to encourage, value and reward innovation efforts (Damanpour 1991; Schlegelmilch, Diamantopoulus and Kreuz 2003; Siguaw, Simopson and Enz 2006). The innovation orientation is a real source of competitive advantage, primarily due to the development of organizational knowledge and strategic intentions that direct functional skills such as human resources, marketing and operations (Siguaw, Simpson, and Enz 2006).

The innovation orientation concept is closely considered in relation with market orientation. Concerning this, Jaworski and Kohli (1996), two reputable authors known for conceptualizing and studying the market orientation, argued that innovation was erroneously excluded from the market-oriented models, this being actually a result of this orientation. Similarly, Han *et al.* al. (1998) stated that literature has only recently begun to study the effects of market orientation on innovation. However, market-oriented companies tend to be more innovative as they respond more quickly to the dynamic needs of consumers (Narver and Slater, 1990). Narver and Slater (1994) suggest that market-oriented organizations are better positioned to anticipate consumer needs which they are responding with innovative products.

To emphasize the importance of the concept, an empirical study conducted by Deshpande, Farley and Webster (1997) on the comparative market performance of the companies in England, France, Germany, Japan and the United States suggests that the effects of innovation orientation on performance are even more important than those of market orientation.

3. The effects of innovation orientation on firms' performance

Review of the literature revealed a diverse range of links between different aspects of focusing on innovation and marketing strategies, cost and performance, and links related to environment organizations.

A first important step in studying the link between innovation and performance orientation was made by Manu and Siriam (1996) that on the basis of considering the concept in a multi-dimensional manner, developed a specific typology of organizations. The authors propose four types of innovation-oriented firms. The first type is the product innovator, group characterized by the highest rate of introduction of new products in both absolute and relative terms. A characteristic of this type are the relatively large expenditures allocated to research and development of new products.

Expenditure on processes research and development are at a relatively average level compared to the sample average. Such organizations have entered the market relatively late.

The second type is represented by process innovators, characterized by the highest spending on processes research and development but relatively average levels of R&D expenditure allocated to products. For the second type, the relative number of new products introduced is small and the absolute number is moderate. This type of organization has entered the market earlier.

The third type is the late entrants and lack of innovation organizations, characterized by having the lowest rates of introduction of new products and relatively low spending on research and development, both for products and processes.

The fourth type is the past pioneers, which is characterized by the lowest expenses for research and development, both for products and processes as well as the lowest rate of introduction of new products and services on the market.

A second phase of the research was to study the allocation of a certain kind of marketing strategy for each type of organization identified in the first phase of research. More recent studies confirm that the innovation orientation is a powerful determinant of business performance of companies, independent of market turbulence in which they operate. Companies that want to embrace this orientation must develop and implement an organizational culture that integrates market orientation, learning orientation and entrepreneurial orientation (Hult *et. al.* 2004).

Research focusing on innovation orientation impact was also discussed by Peng and Dai (2010). Regarding the effect on innovation results they showed that orientation has a positive impact on the number, rate and type of innovations that a firm produces. According to studies conducted by Tushman and O'Reilly, 1996, innovation oriented firms develop more disruptive innovations. At the consumers and competitors levels the research of the two reveals that innovation oriented organizations has a higher level of customer service, a higher loyalty and a better picture. At the competitors' level, the benefits are also on the side of innovative organizations. Thus, according to the study by Lyon and Ferrier (2002) there is a direct link between market share and the number of new products launched. The research shows that employees working in innovation oriented companies have a higher level of job satisfaction, an effect confirmed by Zhou *et al.* (2005). Given the fact that the study of Peng and Dai (2010) had an exploratory character we found interesting to investigate if their hypothesis is empirically confirmed also for Romanian companies. Thus we verify:

- H1: A high level of innovation orientation has a direct, positive and significant influence on customer satisfaction.

4. Research methodology

According to previous guidelines of specialists (Iacobucci, Churchill, 2010), developing a sampling plan involves several steps. In a first step we defined the statistical population under investigation. Given the strategic nature of the questions we have decided that it is necessary that the statistical population included in the research to be represented only by top-level managers. The sampling frame was a executives database personally prepared, containing identifying data for a number of 1,200 top managers of companies activating in Romania. Regarding the sampling method, we opted for a non-probabilistic sampling: convenience sampling. The profile characteristics of the firms included in the survey were analyzed using the following criteria: scope, turnover, and number of employees, type of market and foundation year. Most companies participating in the survey (55%) are medium and large companies operating mainly in B2B. Of the 1,200 people contacted, 98 responded favorably to the questionnaire, representing a response rate of 8.1% which we appreciate as very good for the online administration. Data collection from respondents was done through an electronic service management. The completion request contained a letter of intent in which the scope and importance of the research were presented. A strong emphasis was placed on respecting the condition of confidentiality related to both the name of the respondent and the name of the company which he represents. Treating data collected was performed using univariate statistical analysis methods, bivariate and multivariate. Establishing normal distribution of the variables and the reliability and validity of measurement scales were based on using statistical tests. Also, for model validation statistical testing of hypothesis was performed.

The statistical analysis of data had the following steps:

- Uni and bivariate data analysis in order to obtain some responses related to the research objectives.
- Testing the normality of values distribution of the variables included in the research model.
- Testing the reliability of measurement scales.
- Determination of the factorial scores.
- Testing the validity of the concepts used in the research model.
- Testing the formulated hypothesis.

The innovation orientation construct was measured according to the methodology proposed by Dobni (2010) with 44 items, divided into 6 dimensions: the context of implementation, organizational constituency, learning and development, value orientation, propensity to innovate and creativity and empowerment of employees. The items were measured by means of a 5-point Likert scale, numbered from 1 to 5. The results of the statistical analysis of the construct are shown in Table 1. Customer satisfaction was measured by 4 items according to the methodology proposed by Vorhies and Morgan (2005). Also in this case, the items were measured by means of a 5-point Likert scale steps, numbered from 1 to 5. The results of the statistical analysis of the construct are shown in Table 2.

Table 1 - The results of the statistical analysis of the "*Innovation orientation*"

Construct /Dimension	CODE	Average	Standard deviation
Innovation Orientation	**OI**	3,86	.56
Context of implementation	OIIC	3,82	.68
Organizational constituency	OIOC	3,95	.66
Learning and development	OILD	3,85	.75
Value orientation	OIVO	3,91	.64
Propensity to innovate	OIIP	3,92	.63
Creativity and empowerment	OIECE	3,64	.66

Table 2 - The results of the statistical analysis of the "*Customer satisfaction*"

Construct / Dimension	CODE	Average	Standard deviation
Customer satisfaction	PERCS	3,92	.76

5. Results

The hypothesis testing was performed with SPSS software using linear regression function. The standardized coefficient of the regression function, the value of t statistics and associated significance level according to which it will accept or reject the hypothesis were presented.

Through this hypothesis we aimed to investigate the effect of innovation orientation on customer satisfaction. According to the results shown in the table below, the hypothesis is accepted which is in line with the results of the previous exploratory research to what was earlier referred in this paper. The standardized coefficient of the regression function has the value B = 0.725 and the test t is 6.795 at a significance level of p = 0.000. Therefore, we conclude that between the innovation orientation and customer satisfaction there is a direct, positive and significant link.

The value of the correlation coefficient R = 0.576 indicates the presence of a relative high linear intensity relationship between innovation orientation (the independent variable) and customer satisfaction (dependent variable). The coefficient of determination R^2 shows that a high percentage (33.2%) of the variation in customer satisfaction construct is explained by innovation orientation.

Table 3 - Hypothesis test results

Hypothesis	B	t	p	Result
H1	0,725	6,795	0,000	Accepted

Conclusions and limitations

Romanian managers must understand and encourage the adoption of a strategic innovation orientation of the organizations they lead. The benefits of this type of strategic orientation are multiple and the caused effects have a direct and positive impact on market performance even in a highly competitive context, volatile and uncertain. Although due to the sampling method the result of this research cannot be considered representative for all Romanian companies, the study findings are a strong signal for considering these directions in the management strategies of the current and future executives in Romania, especially those working in the highly competitive domains where innovation is the basis of the competitive advantage.

Aknowledgement

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THE EFFECT OF MARKET ORIENTATION ON INNOVATION OF CZECH AND GERMAN HIGH-TECH FIRMS

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Abstract:

Aim of the article is to find out the causal relationship between dimensions of market orientation (MO) and innovation (INOV). Market orientation was studied as a four-dimensional construct and innovation as a one-dimensional. Market orientation in this study is understood as a process of getting information about customers and competitors, spreading and integrating these information within the company and reactions to these information in the form of a coordinated actions. The studied sample was represented by the Czech (N=164) and German (N=187) high-tech firms in manufacturing industries. Selection of firms was carried out in Albertina and Hoppenstedt database. Respondents in managerial ranks completed the questionnaire and marked their rate of approval with individual statements on a seven point Likert scale. The way to achieve the goals is to quantify market orientation by constructing indices of market orientation. Index of market orientation and innovation was calculated as an arithmetic mean of the measured values. The main method to reach the target was multiple regression analysis. The research confirmed hypothesis about existence of the relation between three dimensions of market orientation - customer intelligence generation (CUIG), intelligence dissemination & integration (IDI), responsiveness to market intelligence (RMI) and innovation in Czech Republic and Germany. No significant relationship was detected between dimension competitor intelligence generation (COIG) and innovation in either of the two countries.

1. Introduction

Company market orientation and innovation has been a popular research topic worldwide. The earlier empirical studies have confirmed that market-oriented companies are more successful in the market. Every company is market-oriented to a certain extent; otherwise it could not stand up to the competition in the current market. The question for managers is how market-oriented their company is, for example when compared to the competition. Not only managers, but also other employees in all departments, must realise and understand the elements, and especially the essence, of the marketing model of market orientation. However, this is of no guarantee that the company actually acts according to the principles of market orientation. Aim of this work is to contribute to a better understanding of this strategic concept also in the Czech and German business environment and to show whether the implementation of market orientation concept positively affects innovation in companies. Managers´ interest in the issue increases every year. This is proven, among other things, by their growing interest in the research results and a large number of new publications on this topic. The high-tech industry is a typical example of an environment where innovation is largely represented. For this reason, the research in hand focuses on this particular sector.

2. Measuring market orientation

There are a large number of strategic orientations of the company, e.g. product orientation, profit orientation or customer orientation (Karlíček 2013). Customer orientation is sometimes considered identical with market orientation (Deshpandé, Farley, Webster 1993). Others argue that customer orientation is insufficient and other stakeholders in the market must be taken into account. Kotler *et al.* (2013) considers competition and customers to be the most important stakeholders. Kaňovská and Tomášková (2014) in their concept of market orientation, also include distributors and suppliers, economic environment, technology and staff among important stakeholders. Different concepts have led to the creation of numerous definitions. However, there are two dominant

approaches created by foreign authors (Kohli, Jaworski and Narver, Slater), providing a concept suitable for our cultural environment. These provide a partial overview of the issue and show the direction in which the further research can navigate. Kohli and Jaworski (1990) understand market orientation as a corporate philosophy. According to them, market orientation can be defined as a process of obtaining market information and it dissemination, integration and use. Other pioneers in area of measuring market orientation of companies were Narver and Slater (1990). They emphasize that market orientation is a part of the corporate culture and that it contributes to the creation of the added value for the customer.

Market orientation is predominantly measured on a five or seven-point Likert scale. It is thus a subjective sort of measurement. The main respondents are generally senior managers with sufficient knowledge about the company across all departments. During the past two decades, a large number of studies in various countries and industries have been conducted. The authors Dwairi, Bhuian and Jurkus (2007) replicated the research of Kohli and Jaworski (1990) of market orientation in a strong growth and highly competitive environment of the Jordanian banking sector. They focused on monitoring the determinants of market orientation, which according to the authors may be just as important as the consequences of market orientation. Regression models were used to test the hypotheses. The results corresponded with the conclusions of the original authors, Kohli and Jaworski (1990), who are widely recognised as the pioneers of the concept of market orientation measuring. Their results suggest that top management is an important factor for the company to become market-oriented. The authors take issue with the conclusions of Hofstede's cultural typology. Hofstede identified Jordan as a country with fixed cultural characteristics that are incompatible with market orientation. Given the results, the authors conclude that the model of market orientation is not necessarily culture-bound. A study of that time (Kuada and Buatsi, 2005) also brought similar results.

Frejková and Chalupský (2013) aimed to determine the relationship between market orientation and Customer Relationship Management (CRM). They proved that there is a certain dependency between the two concepts based on the empirical data obtained from companies in the field of aviation. Recent publications on Czech high-tech companies explored the relationship between market orientation and strategic behaviour (Kaňovská and Tomášková, 2014), and modification of the model of market orientation (Jangl, 2014). Tuominen, Rajala and Möller (2004) analysed the relationship between market orientation and customer intimacy. The main objective of the study by Kumar, Subramanian and Strandholm (2011) was to explore the impact of corporate strategy on the relationship of market orientation and company performance on a sample of 159 American hospitals. Market orientation was measured using a scale originally designed by Narver and Slater (1990) with modifications for medical environments (Kumar, Subramanian and Yauger, 1998). Porter´s generic strategies were measured using a scale proposed by Narver and Slater (1990), also modified for the medical environment. The findings of their study generally offer support for the claims of Narver and Slater (1990) and Kohli and Jaworski (1990) that market orientation has a positive impact on business performance regardless of the type of the company. Chang and Chen (1998) tested the relationship between market orientation, service quality and profitability of brokerage firms in Taiwan. They concluded that market orientation has a positive and significant effect on both the quality of services, as well as on company performance. At the same time, they found out that market orientation does not affect performance solely through service quality.

Market orientation may affect performance directly or indirectly through other intermediaries. The aim of the authors Panigyrakis and Theodoridis (2007) was to explore market orientation in the context of the retail environment in the Greek market and the effect of market orientation on performance of companies in this sector. Supermarket branch managers were chosen as the respondents. To measure market orientation, the authors used MARKOR developed by Kohli, Jaworski and Kumar (1993). A significantly positive effect of market orientation on corporate results was detected. The results showed that retail chains in Greece implement the concept of market orientation. In contrast, Bodlaj (2010) dealt with the influence of responsive and proactive market orientation on innovation and corporate performance. Using the methods of structural equitation modelling, Bodlaj analysed data obtained from 325 Slovenian companies and found no significant link between proactive market orientation and innovation performance, nor between reactive market orientation and innovation performance.

3. Measuring innovation

Innovation is the successful implementation of creative ideas within an organization (Amabile, 1988). Thompson (1965) cited in Calaton, Cavusgil, Zhao (2002) defines innovation as follows: the generation, acceptance, and implementation of new ideas, processes, products, or services. According to Trommsdorff, Steinhoff (2009, p. 19) a rapid development of technologies is currently the biggest external drive of innovation (e.g. this includes new information and communication technology, nanotechnology, biotechnology, neurophysiology etc.). Furthermore, the same authors report a significant innovation pressure on businesses and in the long run only those able to can keep up, will survive. In order to keep up, it is necessary to have continuous information about the strategic situation of the company, and also about the development in the field, about the target customers and the competition. The factors of innovation drivers seem to be very different and interactive among themselves. If the company aims to maximize its profits, it must offer its customers modern and high quality products.

According to Nožička and Grossová (2012), innovative products are more likely to succeed in competitive markets. The authors confirmed the relationship between market orientation and business performance of innovative companies in the two regions of the Czech Republic. Measuring innovation is also covered in Serna, Guzman, Castro (2013) in Mexican manufacturing plants (N=286), Remli *et al.* (2013) in Malaysia, Bastič and Leskovar-Špacapan (2006) in Slovenian companies (N=82), Manzano, Küster and Vila (2005) in Spanish textile companies or Agarwal, Erramilli and Dev (2003) in the hospitality industry. Hurley and Hult (1998) investigated the connection between innovation, market orientation and corporate culture in the USA. Calatone, Cavusgil, Zhao (2002) tested the relationship between Learning Orientation, Innovation Capability and Firm Performance on a sample of US firms (N=187). The authors confirm the positive effect of learning orientation on firm innovativeness. Ma, Zhu, Hou (2011) in China, arrived at the conclusion that learning orientation positively affects the process innovation that lead to an improved firm performance.

4. High-tech manufacturing industries

Table 1 - High-tech manufacturing industries by CZ-NACE

Production of pharmaceutical products and services (division 21)
Production of computers and electronic components (groups 26.1, 26.2)
Production of consumer electronics and optical instruments (groups 26.3, 26.4, 26.7, 26.8)
Production of measuring, testing, navigation and medical instruments (groups 26.5, 26.6)
Production of planes and their engines, spaceships and associated equipment (group 30.3)

Source: Own elaboration

5. Research method, sample structure and hypotheses

For the purposes of this research a modified measuring scale of market orientation (MMOS) was used (see Appendix). The model for measuring market orientation, describing the scale, includes four dimensions and twelve items: customer intelligence generation, competitor intelligence generation, intelligence dissemination & integration and responsiveness to market intelligence (implementation of the action). Within the study, innovation was measured using one-dimensional model with three items which were created on the basis of definitions and previous research. An exploratory factor analysis was carried out to confirm the dimensionality for market orientation and innovation. Internal consistency of the items was calculated using the coefficient Cronbach's Alpha. Using Likert scale from 1 (absolutely disagree) to 7 (completely agree) attitudes of respondents were identified. The group of respondents consisted of managers (N=164) of high-tech companies of the Czech Republic. The method of on-line polling CAWI was used for data collection. The market orientation index was calculated as the average of the model items. We proceeded similarly with

innovation. The relationship between market orientation and innovation was investigated using a multiple regression analysis, at first on the Czech data set and subsequently the German data set was analysed. Pearson correlation coefficient was also applied to examine the hypothetical relationships. All statistical data processing was performed using the IBM SPSS Statistics version 21 and IBM SPSS AMOS version 22 software.
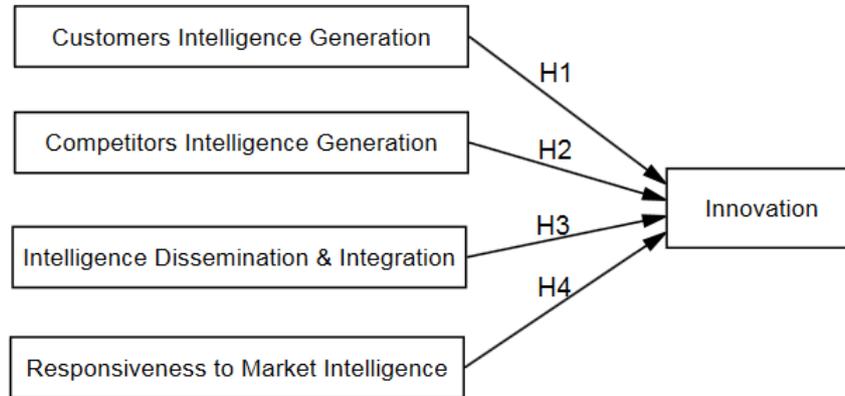
Figure 1 - Conceptual Framework

*Source***:** Own elaboration

Hypotheses

H_1**:** Customer Intelligence Generation has a statistically significant influence on innovation.

H_{01}**:** Customer Intelligence Generation has no statistically significant influence on innovation.

H_2**:** Competitor Intelligence Generation has a statistically significant influence on innovation.

H_{02}**:** Competitor Intelligence Generation has no statistically significant influence on innovation.

H_3**:** Intelligence Dissemination & Integration between departments and staff has a statistically significant influence on innovation.

H_{03}**:** Intelligence Dissemination & Integration between departments and staff has no statistically significant influence on innovation.

H_4**:** Responsiveness to Market Intelligence has a statistically significant influence on innovation.

H_{04}**:** Responsiveness to Market Intelligence has no statistically significant influence on innovation.

6. Statistical Results

a) Czech high-tech firms

Table 2 - Arithmetic mean ($\bar{x}$), Standard deviation (SD), Correlations

	$\bar{x}$	SD	Level MO	Correlations					
				CUIG	COIG	IDI	RMI	MO	INOV
Customers Intelligence Generation (CUIG)	5.88	0.88	high	1					
Competitors Intelligence Generation (COIG)	5.13	1.21	medium	0.43**	1				
Intelligence Dissemination & Integration (IDI)	5.12	1.11	medium	0.29**	0.21**	1			

Responsiveness to Market Intelligence (RMI)	4.67	1.13	low	0.35**	0.46**	0.41**	1		
Market Orientation (MO)	5.20	0.78	medium	0.68**	0.75**	0.67**	0.78**	1	
Innovation (INOV)	5.25	1.03	medium	0.41**	0.30**	0.49**	0.45**	0.57**	1

Source: Own elaboration

Note: < 5 (low level), <5; 5.5> (medium level), > 5.5 (high level); ** Pearson correlation is significant at 0.01 level.

Based on an index of Cronbach's alpha and exploratory factor analyses, dimensionality of the model was confirmed. Market orientation is indeed made up of four factors and innovation of one factor. Cronbach's alpha coefficient of 0.83 was detected, which is considered a favourable result. The minimum recommended value is 0.6 to 0.7 (Hair, 2006). After removing an item, the coefficient value would not increase. The highest rating was found in the factor: Customer Intelligence Generation ($\bar{x}$=5.88). The lowest average rating factor was: Responsiveness to Market Intelligence ($\bar{x}$=4.67). The other two factors were evaluated approximately the same by the respondents - Competitors Intelligence Generation ($\bar{x}$=5.13) and Intelligence Dissemination & Integration ($\bar{x}$=5.12). Their arithmetic means and standard deviations are very similar. The overall market orientation index ($\bar{x}$=5.20) was calculated as the arithmetic average of the four dimensions (12 items). The overall innovation index ($\bar{x}$=5.25) was calculated as the arithmetic average of the three items (see Apendix).

Multiple linear regression

Independent variables in the model represent the given dimensions of market orientation and the dependent variable is innovation.

The expected model is of the following form:

$$\widehat{IN} = \beta_0 + \beta_1 CUIG + \beta_2 COIG + \beta_3 IDI + \beta_4 RMI \qquad (6.1)$$

All correlations are statistically significant. The items are not highly correlated, which means fulfilment of the assumed absence of multicollinearity. VIF (variable inflation factor) is below the value of 5, the tolerance value is not less than 0.2. Multiple normality was verified by a histogram of standardised residuals and pp plot of standardised residuals. A histogram of standardised residuals forms a Gaussian curve, a symmetric bell-shaped distribution. Standardised residuals are located along the line of normal distribution. The linearity of the relationships among variables and homoscedasticity were verified by a scatterplot of standardised residuals and standardised predicted values. The graph of standardised residuals in relation to the standardised predicted values shows no pattern.

Model properties – Czech high-tech firms

Table 3 shows that the model is statistically significant (F = 22.046***), with the significance level of 0.001 and it explains 34% of the variance of the dependent variable.

Table 3 - Significance of the model

R	R Square	Adjusted R Square	F
0.597	0.357	0.341	22.046***

Source: Own elaboration

Three coefficients are statistically significant at a significance level of 0.01 or 0.001 (see Table 4). There is a positive relationship among three components of market orientation (customer intelligence generation, intelligence dissemination & integration, responsiveness to market intelligence) and innovation. The null hypotheses have been rejected. At first sight, you can see that no significant relationship towards innovation was detected in the factor of obtaining market information on the competitors (β_2= 0.04, p=0.62). Based on the standardised beta coefficients, it is possible to say that the ability to disseminate and integrate information has the biggest impact on innovation

(β_3=0.32***). The acquisition of information about customers and company's ability to use the information have the same impact on innovation ($\beta_1 = \beta_4$ =0.22***).

Table 4 - Coefficients

Model	Unstandardised Coefficients		Standardised Coefficients	t-Value	Results
	B	Std. Error	Beta		
Constant	1.073*	0.490		2.190	
Customers Intelligence Generation (CUIG)	0.261**	0.086	**0.22*****	3.055	**Reject H$_{01}$**
Competitors Intelligence Generation (COIG)	0.032	0.064	**0.04**	0.496	**Accept H$_{02}$**
Intelligence Dissemination & Integration (IDI)	0.301***	0.066	**0.32*****	4.584	**Reject H$_{03}$**
Responsiveness to Market Intelligence (RMI)	0.200**	0.071	**0.22*****	2.181	**Reject H$_{04}$**

Note: ***(p<0.001), **(p<0.01), *(p<0.05) , INOV (dependent variable)
Source: Own elaboration

The model takes the following form:

$$\widehat{IN} = 1.073 + 0.261CUIG + 0.032COIG + 0.301IDI + 0.200RMI \qquad (6.2)$$
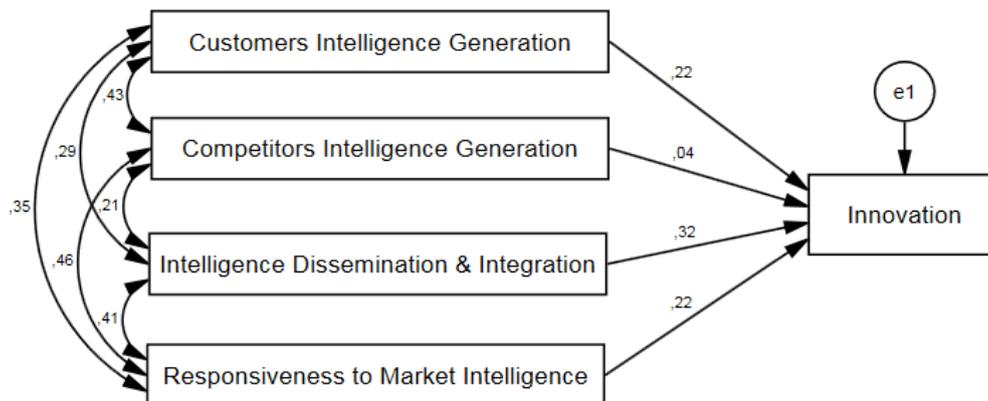
Source: Own elaboration

Figure 2 - Graphical representation of the model

b) German high-tech firms

The prerequisites for regression analysis were verified once more: a) Dependent variable "innovation" is an interval variable, b) All independent variables are also measured at the interval level, c) Independent variables are not highly correlated =) absence of multicollinearity.

Table 5 - Arithmetic mean (x̄), Standard deviation (SD), Correlations

	x̄	SD	Level MO	Correlations					
				CUIG	COIG	IDI	RMI	MO	INOV
Customers Intelligence Generation (CUIG)	5.74	0.99	high	1					
Competitors Intelligence Generation (COIG)	5.16	1.07	medium	0.43**	1				
Intelligence Dissemination & Integration (IDI)	5.03	1.17	medium	0.38**	0.27**	1			
Responsiveness to Market Intelligence (RMI)	4.64	1.08	low	0.38**	0.50**	0.51**	1		
Market Orientation (MO)	5.14	0.81	medium	0.71**	0.73**	0.74**	0.80**	1	
Innovation (INOV)	5.22	1.03	medium	0.43**	0.35**	0.53**	0.50**	0.61**	1

Source: Own elaboration

Note: < 5 (low level), <5; 5.5> (medium level), > 5.5 (high level); ** Pearson correlation is significant at 0.01 level

The highest received score was again detected in the factor: customer intelligence generation (x̄=5.74). The lowest rated factor was: responsiveness to market intelligence (x̄=4.64). The remaining factors were evaluated similarly by the respondents. In other words, their arithmetic means and standard deviations are very similar.

Model properties – German high-tech firms

The model is statistically significant (F = 29.756***), with the significance level of 0.001 and explains 38% of the variance of the dependent variable.

Table 6 - Significance of the model

R	R Square	Adjusted R Square	F
0.629	0.395	0.382	29.756***

Source: Own elaboration

There is a positive relationship between the three components of market orientation and innovation. The null hypotheses H_{01}, H_{03}, H_{04} have been rejected, the null hypothesis H_{02} has not been rejected. Based on the standardised beta coefficients, it can be argued that the company's ability to disseminate and integrate the information obtained has the greatest impact on innovation (β_3=0.32***).

Table 7 - Coefficients

MODEL	Unstandardised Coefficients		Standardised Coefficients	t-Value	Results
	B	Std. Error	Beta		
Constant	1.266	0.401		3.156	
Customers Intelligence Generation (CUIG)	0.206**	0.070	**0.20****	2.940	**Reject H_{01}**

Competitors Intelligence Generation (COIG)	0.064	0.067	**0.07**	0.955	**Accept H$_{02}$**
Intelligence Dissemination & Integration (IDI)	0.280***	0.060	**0.32*****	4.635	**Reject H$_{03}$**
Responsiveness to Market Intelligence (RMI)	0.222**	0.071	**0.23*****	3.130	**Reject H$_{04}$**

*Note***: ***(p<0.001), **(p<0.01), *(p<0.05), INOV (dependent variable)
*Source***: Own elaboration

The model takes the following form:

$$\widehat{IN} = 1.266 + 0.206 CUIG + 0.064 COIG + 0.280 IMI + 0.222 RMI \tag{6.3}$$
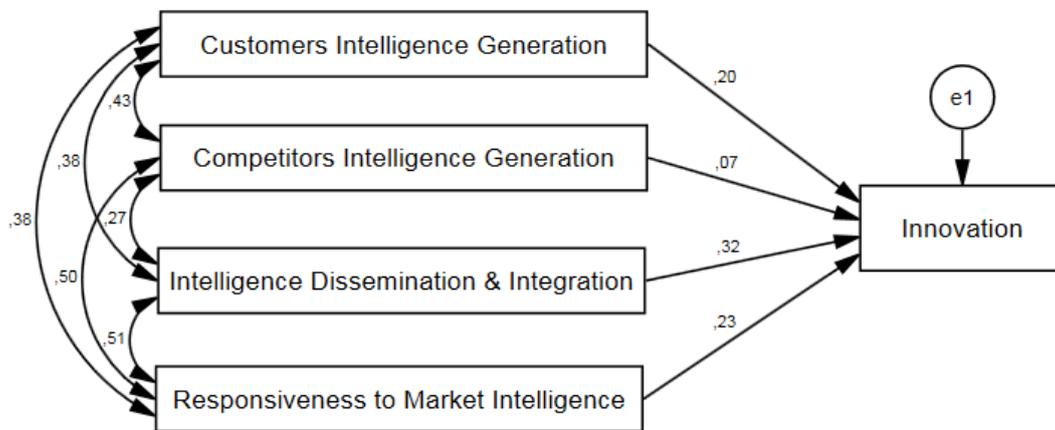
Source: Own elaboration

Figure 3 - Graphical representation of the model

Table 8 – Result summary

Independent variable	Dependent variable	Hypotheses	Beta Czech sample	Beta German sample
CUIG	Innovation	H$_1$	**0.22*****	**0.20****
COIG	Innovation	H$_2$	**0.04**	**0.07**
IDI	Innovation	H$_3$	**0.32*****	**0.32*****
RMI	Innovation	H$_4$	**0.22*****	**0.23****

*Note***: ***(p<0.001), **(p<0.01)
*Source***: Own elaboration

7. Discussion

The research was divided into two parts. First, an analysis of Czech data set was conducted, subsequently German data set was analysed. The data analysis yielded some interesting conclusions, see Table 8. In the first case, a statistically significant relationship among three dimensions of market orientation and innovation was confirmed. The strongest influence on innovation was detected in the dimension Intelligence Dissemination & Integration ($\beta_3 = 0.32$***) in both countries. Information dissemination and integration of knowledge is very important and help to develop a new strategy in high-tech companies. Responsiveness to market intelligence showed a weaker but statistically significant relationship on innovation in Czech Republic ($\beta_4 = 0.22$***) and Germany ($\beta_4 = 0.23$**). In

practice, responsiveness to market intelligence would mean for example launching a new product on the market. And finally obtaining market information about the customers has similarly strong significant relationship in Czech Republic ($\beta_1 = 0.22***$) and Germany ($\beta_1=0.20**$). No significant relationship towards innovation was detected in the factor of competitors intelligence generation in Czech Republic ($\beta_2 = 0.04$) and Germany ($\beta_2 = 0.07$). Using a multiple regression data analysis, we confirmed that the factors have the greatest influence on innovation when acting simultaneously. Also Pearson correlation coefficient is greater in the case of simultaneous action than in each dimension separately. Such a finding can also be found in foreign literature, e.g. in the conclusion of Al-Dmour and Basheer (2012) regarding the telecommunication and information sector. Similar results were obtained by for example (Runing, Harsono and Haryono, 2014), who argue that the focus on customers and competition has a positive and significant impact on technological innovation. Kaňovská and Tomášková (2012) found a positive, significant relationship between competition orientation and firm performance.

The simplified scale used in this work (see Appendix) may serve managers to evaluate the degree of market orientation in their company at any time. The final score is to be achieved either by summing or as an arithmetic mean of all responses (index of market orientation). According to Frejková and Chalupský (2013) companies with a market orientation index 5.5 and higher, can be described as highly market-oriented, and companies with a value below 5 as weak market-oriented ones. It follows that companies with a value in the interval <5; 5.5> are moderately market-oriented. The researched high-tech firms were of a medium/moderate level of market orientation in Czech Republic ($\bar{x}=5.20$) and Germany ($\bar{x}=5.14$). There is, therefore, room for their improvement in the future. It seems appropriate to point out that the results should be collected at regular intervals (the author recommends to do so annually) and compared not only internally, within the company, but also with other companies in the same sector e.g. through benchmarking. Furthermore, the results suggest that the highest index value of market orientation was achieved in the dimension Customer Intelligence Generation in Czech Republic ($\bar{x}=5.88$) and Germany ($\bar{x}=5.74$). This may indicate that companies are indeed able to obtain valuable information about their customers. There are several ways worth mentioning, e.g. data analysis of customer complaints, frequent personal meetings with key customers, regular survey of hidden needs, etc. As for information dissemination & integration, the index values are rather average ($\bar{x}=5.12$) in Czech Republic and ($\bar{x}=5.03$) in Germany, which may be explained by the level of internal company communication. Especially in large companies that employ thousands of employees, there may be certain complications in sharing information and its transformation into knowledge. If there is a lack of formal, informal, horizontal and vertical communication within the company, then information and knowledge is not shared in a timely and sufficient manner among all departments. In practice, it usually happens that the marketing department does not cooperate effectively with the production, sale and purchase departments. Then the newly developed product does not sell well if customers are not interested in it. The spirit of competition rather than cooperation often dominates in the companies between its departments. Karlíček *et al.* (2014) and Kotler, Rackham and Krishnaswamy (2006) also claim the same. The lowest value was detected in the response to market information ($\bar{x}=4.64$) in Czech Republic and ($\bar{x}=4.67$) in Germany. This testifies to the fact that high-tech firms, although much interested in the market development, do not know how to process such information sufficiently and promptly and use it for a strategic action.

In the Czech Republic, many companies seem unwilling to invest in market research or to hold regular meetings of all company departments. The entire process is time-limited. Time is the greatest enemy of innovative companies, therefore the response or strategic reaction to market intelligence must follow immediately in the dynamic environment of high-tech companies. A similar survey of implementation of market orientation in 88 high-tech companies was conducted by Chalupský *et al.* (2009). The team used a different measurement (the method of Tomášková) and determined the average value of market orientation ($\bar{x}=5.2$) in the Czech Republic. This finding is consistent with the current result values of this work ($\bar{x}=5.2$).

Conclussion

The aim of this article was to test the relationships between market orientation and innovation in Czech and German high-tech companies. The results are to serve as further evidence of a positive significant relationship between market orientation and innovation. The research included 164

respondents from the Czech Republic and 187 from Germany who ranked their answers using a Likert scale ranging from 1 (absolutely disagree) to 7 (completely agree) for each item in the questionnaire.

The statistical analysis clearly confirmed three hypothetical relationships in both countries. Obtaining market information about customers positively affects corporate innovation. The dissemination and integration of information within the company and the subsequent implemented action also have a positive impact on innovation. As for monitoring the competition, its positive effect on innovation has not been confirmed in this study. However, a similar research in the Czech Republic and Germany does not exist at the moment. Therefore further research in this area is highly recommended.

Based on the results, it may be stated that Czech and German high-tech companies are moderately market-oriented. The highest index score was reached in obtaining market information about customers (Customer Intelligence Generation). Obtaining market information about competitors (Competitors Intelligence Generation (COIG) ranked second. The lowest index value was detected in the dimension Responsiveness to Market Information (RMI). The study also showed that large high-tech companies do not display difficulties in obtaining market information. The problem arises with coordination of the information flow, its converting into knowledge and implementation of the subsequent strategic action.

Acknowledgements

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APPENDIX

A) The Modified Market Orientation Scale (MMOS)
Customers Intelligence Generation
1. We systematically collect and evaluate data about satisfaction or non-satisfaction of customers.
2. We have regular meetings with customers in order to learn their future expectations in time.
3. We permanently strive for a deeper understanding of the hidden needs and requirements of customers.

Competitors Intelligence Generation
4. We monitor mutually competing firms in our branch.
5. We perform evaluation of strong and weak points of major competitors.
6. We try to predict a future behaviour of competititors.

Intelligence Dissemination & Integration
7. We inform each other about successful and unsuccessful experience with customers across all company departments.
8. In our company we hold a lot of formal and informal talks where we solve present business success, market opportunities or risks.
9. Market information are integrated in this workplace before decisions are made.

Responsiveness to Market Intelligence
10. Our reaction to the competitor's price campaign is very short.
11. Principles of market segmentation control development of new products in our firm.
12. We react immediately if the competition launches intensive advertising campaign aimed at our customers.

B) Innovation
13. Company climate can be called creative.
14. Our attitude to innovations is positive.
15. Help in developing new ideas is always readily available.

IS ALGERIA READY TO INTEGRATE THE KNOWLEDGE-BASED ECONOMY?

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Abstract:

This paper focuses on the problem of Algerian economy mutation, from an economy based on oil as the sole source of income, to a knowledge economy based on competence of human resources and knowledge to achieve economic growth. This paper try to find answers to the following questions: what is the position of Algeria against the indicators of the Knowledge economy compared to the rest of the world? What mechanisms and policies that should be put in place to integrate Algeria in this new economy? Based on a comparative analysis we examine the readiness of the Algerian economy to Integrate Knowledge economy. The study adopts The World Bank methodology based on the four pillars– institutional regime, education, innovations and ICT. It summarizes both positive and negative sides, difficulties, and relies on the possible actions to resolve them regarding the attainment of the relevant national objectives. The study revealed that Algeria should pursue a long-term strategy for the development of knowledge, focusing on achieving a real rate of growth.

Keywords: Knowledge-based economy; methodology of the World Bank; knowledge indicators; information and communication technologies

JEL Classification: F15, F63, H52, I23, O38

1. Introduction

Nowadays, Algeria is living in the rhythm of significant changes characterized by the proliferation of new information and communications technologies (ICTs) and an exceptional technological progress that led to the appearance of a new form of economic development, namely the knowledge-based economy. According to economists, knowledge-based economy is an essential element for passing the status of developing country to that of a developed country, to the extent that knowledge is the key to economic growth and the indicator of the power of nations.

Algeria must take advantage of this new economy with what it offers itself as challenges and opportunities for sustainable development. But this can only be achieved through the establishment of a clear strategy, especially as the Algerian economy, although it is still lagging behind compared to economic growth, is characterized by a number of favourable factors.

This paper focuses on the problem of Algerian economy mutation, from an economy based on oil as the sole source of income, to a knowledge economy based on competence of human resources and knowledge to achieve economic growth.

The main issue addressed in the context of this paper focuses on the study of the readiness of Algeria to integrate into an economy based on knowledge and find answers to the following questions: - What is the situation of Algeria against the indicators of the new economy compared to the rest of the world? - What mechanisms and policies that should be put in place to integrate Algeria in this new economy?

Our study is based on the following assumptions: First, the Algerian economy has all the components allowing heading for the knowledge-based economy. Second, Algeria has still not adopted the knowledge economy. The importance of the study lies in the understanding of the situation in Algeria related to the knowledge economy context, especially as the experiences around the world have proved that this approach is a fundamental factor in the passage from the status of low-income countries to that of developed countries, like Malaysia case. The objective of this study is to identify the performance of the Algerian economy in the different areas of the knowledge economy by exploiting the methodology of the World Bank that defines the framework of the knowledge economy and its fundamentals.

The methodology adopted in our study is based on a comparative analysis of the variables and indicators of the knowledge economy in Algeria, compared to other countries, according to the available data from different sources corresponding to the period between 2003 and 2013. Indeed, it was in 2003, through the first Conference of Marseille, that has started the interest of integration of Algeria in this new economy. This conference has been followed by several other conferences dealing with the same subject. To consider various aspects of this thematic, the study will discuss the following points:

- Introduction to the knowledge economy.
- Indicators of the knowledge economy.
- Orientation towards knowledge-based economy in Algeria.

2. The knowledge economy

The knowledge economy concept is widely used in the literature of economics. However, before defining it, the concepts of information and knowledge must be clarified.

2.1. Information and knowledge

The information represents the data for decision making (Salah Eddine 2001). These data are useful to achieve specific goals at a specific period of time and are based, to a large extent, on the ability of the recipient to take advantage of it.

Knowledge consists of data, information, recommendations and innovations or all symbolic structures supported by man or acquired by the Company (United Nations 2009). Knowledge is also regarded as the symbiosis of experience, values, previous information and expert views that present a framework for the evaluation and adoption of new information and experiences (Rabhi 2008). The concept of knowledge is broader than the information the extent that it is the combination of information, experience, expertise and sensory abilities of people to reach a new and useful knowledge for society. Knowledge comes in two forms: codified and tacit. Codified knowledge is clear and can be transcribed as mathematical equations, laws or regulations. While tacit knowledge, more personal and limited in the human mind, is difficult to measure and manageable.

2.2. Definition of knowledge economy

Although the role of knowledge and its effects on the economy are nothing new, the knowledge economy is changing rapidly, very large scale, which induces a change in economic thought with all the specificities distinguished from classical economics, raising debates and discussions and highlighting several names: new economy, digital economy, virtual economy and several definitions:

- The knowledge economy means moving the centre of gravity of the raw materials and capitalist infrastructure to the data concentration, learning and research centres and the development of artificial cognitive system (Rabhi 2008).
- The Asia-Pacific Economic Cooperation (APEC) defines the knowledge economy as an economy based mainly on knowledge production, dissemination and use as a main driver for the development of wealth and hands of work in all economic sectors (Al Hachimi *et al.* 2007).
- It is an economy in which the production of goods and services is based increasingly on the volume of knowledge, in large quantities, to become the main source of wealth creation (Djeflat 2006a-2006b).

In general, the knowledge economy is an economy in which knowledge plays a key role in the economic activity, the basis is the human factor, able to produce, use and disseminate knowledge to achieve economic growth.

2.3. The specifics of the knowledge economy

The knowledge economy has its specific characteristics from those of knowledge, distinguishing in many aspects (United Nations 2009):

- The growing role of innovation and scientific research.
- Lifelong learning as a basis for economic productivity and competitiveness.

- The role of the communications industry and information technology as a key catalyst for growth.
- Existence of a favourable environment for the activation of the new economy mechanisms.
- Availability of knowledge as a commodity.
- Consideration of knowledge capital as a fundamental element of competitiveness.
- Sovereignty of global competition markets.
- Ability to learn and quick adaptation of the workforce.
- Dependence of high growth potential businesses in the information technology and communication.

2.4. Fundamentals of knowledge economy

Knowledge economy is based on four pillars:

- *An efficient innovation system:* An efficient system of relations between academic institutions and other organizations able to follow the knowledge revolution growing to be appropriated and adapted to national needs in the context of the changing global environment.
- *The base of information and communications technologies*: This base facilitates the dissemination of information and knowledge and adapts it to the domestic needs, in order to support economic activity and stimulate promising projects with high added value.
- *Education*: It is a critical need for economic productivity and competitiveness. Indeed, governments are obliged to provide skilled labour and creative as well as a human capital capable of integrating new technologies in the workplace, with a need for more and more urgent to incorporate information and communication technologies, and even creative skills in teaching methods and learning throughout life.
- *Good governance:* It is based on solid economic foundation, capable of providing regulatory and policy frameworks to increase productivity and growth. These policies aim to make information and communication technology easily accessible, reduce tariffs on technology products and to increase the competitiveness of SMEs.

2.5. Knowledge economy indicators

The methodology of the World Bank to measure knowledge (KAM: Knowledge Assessment Methodology) is one of the main tools to measure the ability of states to find, produce and disseminate knowledge and their ability to cope with competition in the knowledge economy. This methodology includes 109 indicators (variables), on four foundations or pillars. The indicators are calculated on the basis of the average rate of return in a country or region, through the measurement of the indicator of knowledge and of the knowledge economy. According to the World Bank, four categories of indicators are the basis of the knowledge economy (Chen 2005): Education, Innovation, ICT, Economic and Institution Regime.
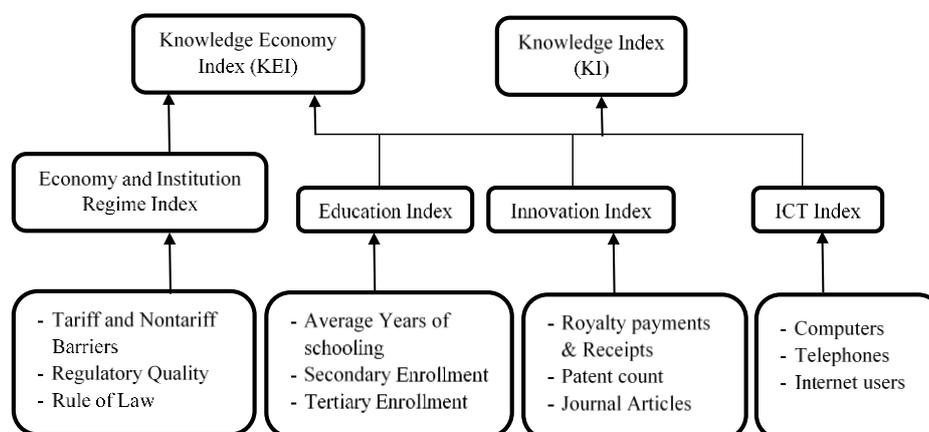
Figure 1 - Knowledge economy indicators

*Source***:** The World Bank, Knowledge Economy Index (KEI) 2012 Ranking.
http://www.worlbank.org/kam

There are six scenarios to expose and analyse the results of these indicators (World Bank, 2012):

▪ *The overall indicator*. It covers the knowledge Index indicators and the knowledge Economy Index indicators:
  - Knowledge Indicator (KI) = Innovation + Education + ICT
  - Knowledge Economy Indicator (KEI) = Knowledge Indicator + Economic and Institution Regime.

▪ *Basic scorecard.* Composed of 12 key variables as proxies to benchmark countries on the aforementioned four the knowledge economy pillars and derive their overall the knowledge economy Indicators (KEI) and knowledge indicator (KI) indexes. Each foundation of the knowledge economy includes three indicators in addition to the knowledge indicator (KI) which gives the average yield of the three main indicators (education, innovation and ICT) as well as the indicator of the knowledge economy (KEI), which measures the performance of each main indicator. The scorecard allows comparisons for up to three countries for 1995, 2000 and the most recent available year.

▪ *Custom scorecard.* Allows any combination of the 148 variables and to compare the degree of integration of up to three countries or regions in the knowledge economy for 2000 and the most recent available year.

▪ *Overtime comparison*. It highlights progress on Knowledge Economy pillars and indexes of different countries from 1995 to the most recent year.

▪ *Cross country comparison*. Allows bar-chart comparison of up to 20 countries on their KEI and KI indexes while demonstrating the relative contribution of different KE pillars to the countries' overall knowledge readiness.

▪ *World map*. Provides a color-coded map for the global view of the world's knowledge economy readiness for 1995, 2000 and the most recent year.

To all these pillars are associated quality indicators, representing 148 variables extracted from data of 146 countries to measure their readiness to introduce the knowledge economy. All these variables are measured on a scale ranging from 0 to 10 degrees. An indicator approaching 10 degrees is the sign of a higher level of knowledge economy and proof that the country is on path for the knowledge economy, while the 0 degree demonstrates just starting country on the path the knowledge economy. This methodology allows to identify barriers and opportunities for countries as well as areas where they should invest their resources to develop their growth based on knowledge (Djeflat, 2006a).

For simplicity, 12 variables based on the 4 pillars of the knowledge economy are taken into account to measure the degrees of preparing of any country in respect to knowledge economy, as shown in the following table.

Table 1 - Measurement of knowledge economy indicators

4 pillars of the Knowledge Economy	Knowledge Economy Variables
Economic and Institution Regime	▪ Tariff and Nontariff Barriers ▪ Regulatory Quality ▪ Rule of Law
Education	▪ Average Years of schooling ▪ Secondary Enrollment ▪ Tertiary Enrollment

4 pillars of the Knowledge Economy	Knowledge Economy Variables
Innovation	▪ Number of researchers in Research and ▪ Development (R&D) per million inhabitants ▪ Number of patents granted by the US Patent and ▪ Trademark Office (USPTO) per million inhabitants ▪ Articles published in scientific and technical journals
ICT	▪ Telephones per 1000 inhabitants ▪ Computers per 1000 inhabitants ▪ Internet users per 1000 inhabitants

Source: The World Bank Institute, "Measuring Knowledge in the world's economies", 2008

3. ALGERIA: Towards Knowledge-Based Economy

To discuss the requirements of Algeria to access the knowledge economy we will try to apply the methodology of the World Bank based on the four pillars of the knowledge economy by studying the indicators according to the available statistics:

- Economic and Institution Regime: It consists of several indicators including:
  - Annual growth rate of GDP per person.
  - Unemployment rate.
- Innovation: It is a simple variable rate of :
  - Expenditure and revenue taxes.
  - Applications for UPSTO patents.
  - Articles and publications in scientific and technical journals.
- Education:
  - Human Development Index.
  - Literacy Rate.
  - Secondary education rate.
  - Higher education rate.
- ICT:
  - Number of telephones per 1,000 person.
  - Number of computers per 1,000 person.
  - Number of internet users per 1000 person.

3.1. Knowledge economy in Algeria in comparison to other countries

The study conducted in 2012 with the methodology of the World Bank on the index of the knowledge economy of 146 countries (The World Bank, 2012), highlights Sweden top the list while Algeria occupies the 96th place with a KEI index equivalent to 3.79 points improving its ranking obtained in 2000 by 14 places. In comparison with other Arab countries, Algeria occupies the 7th place after United Arab Emirates with 6.94 points, Oman with 6.14 points, Saudi Arabia with 5.96 points, Qatar with 5.84 point, Kuwait with 5.33 points, and Tunisia with 4.56 points. Algeria is ranked 6th among the 10 countries that have experienced an improvement in the ranking of 2012 index, as shown in Table 2.

Through the comparison of the components of the knowledge economy index of Algeria and that of Saudi Arabia, ranked first, it is better placed in the overall indicators although Algeria knows better improvement in the Economic and Institution Regime (EIR) and also in the innovation (Index of the innovation: 0 for Saudi Arabia and 16 for Algeria). Saudi Arabia improvements are due to the efforts of investing in knowledge since the World Bank report of 2000. Saudi Arabia has exceeded many developed countries, jumping of 26 places from the year 2000 to rank at the 50th position on 146 countries. Saudi Arabia is being the only Arab country to be included in the global map of science in 2012, by having reached the necessary standards based on the GDP expenditure rate in the scientific research, the rate of engineers and scientists per the number of inhabitants and the volume of expenditure on scientific research.

Table 2 - Top 10 countries have evolved in the KEI ranking of 2012

Country/Economy	KEI Rank Change	KEI 2012 Rank	KEI 2012	EIR Rank Change	EIR 2012 Rank	Innovation Rank Change	Innovation 2012 Rank	Education Rank Change	Education 2012 Rank	ICT Rank Change	ICT 2012 Rank
Saudi Arabia	26	50	5.96	+17	60	0	84	+30	58	+45	21
Oman	18	47	6.14	-9	44	+26	57	+15	74	+19	55
Macedonia, FYR	16	57	5.65	+34	59	+10	69	-12	78	+17	48
Azerbaijan	15	79	4.56	+24	103	+14	89	+8	53	+26	78
Albania	14	82	4.53	+50	71	+8	101	-16	83	+37	72
Algeria	14	96	3.79	+23	115	+6	99	+21	71	+21	89
Rwanda	14	127	1.83	+45	95	+10	134	+2	137	+3	143
Belarus	11	59	5.59	+21	114	+5	60	-1	33	+20	47
Romania	9	44	6.82	+20	40	+10	53	+19	29	+5	59
Russian Federation	9	55	5.78	+15	117	+11	40	-17	44	19	44

*Source***:** The World Bank, "Knowledge Economy Index (KEI) 2012 Ranking"; http://www.worlbank.org/kam

In conclusion, the efforts made by Algeria are insufficient in this area, it needs to do more to improve the performance level of each indicator to establish a knowledge-based economy and join developed countries.

3.2. Detailed analysis of the knowledge economy indicators of Algeria

From Table 2, it is clear that a rapprochement between la values of knowledge economy indicators of Algeria, the value of the "Economic and Institution Regime" indicator being the smallest. We will try, in the following sections, to analyse each indicator separately.

3.2.1. Economic and institution regime

These indicators relate to the efficiency of the economy to achieve economic growth.

▪ *Annual growth rate of GDP*

According to a study conducted by the Global Finance magazine (2014) on the richest and poorest countries, Algeria occupies the 10th place in the Arab world with GDP equivalent to 7736 dollars in 2013. Through the comparison of the average growth rate of GDP of some oil-exporting countries such as Qatar and Saudi Arabia, we see a decline of Algeria with attempts to address this problem, but without much success, as shown in the following table.

Table 3 - Annual growth rate of GDP for Algeria, Qatar and Saudi Arabia

	2000-2007	2008	2009	2010	2011	2012	2013	2014
Algeria	4 ,4	2,0	1,7	3,6	2,4	2,5	3,3	3,4
Qatar	12,0	17,7	12,0	16,7	13,0	6,6	5,6	5,0
Saudi Arabia	4,8	8,4	1,8	7,4	8,5	6,8	4,4	4,6

*Source***:** The International Monetary Fund (IMF), Middle East and North Africa: identification of the next track, 2013

We note that the development of the GDP growth rate in Algeria is still low compared to Qatar or Saudi Arabia, due to unbalanced growth where the hydrocarbons sector, which represents 98% of exports, and the lack of an economic diversification policy.

▪ *Unemployment rate*

In terms of unemployment, Algeria is ranked 13th in the Arab world, just after Saudi Arabia (12th), by reaching 10% in 2012 (CHRIT 2013). Statistics show that the most affected category by unemployment is 16-29 years. Table 4 shows a comparison of unemployment rate in Algeria from 2003 to 2010 with those of Morocco and Tunisia.

Table 4 - Unemployment trends in Algeria compared to Morocco and Tunisia
(from 2000 to 2010)

	2003	2004	2005	2006	2007	2008	2009	2010
Algeria	23,70	20,10	15,30	12,30	13,80	11,30	10,80	10,00
Tunisia	14,50	13,90	12,90	12,50	12,40	12,40	13,30	13,00
Morocco	11,60	11,90	10,80	11	9,70	9,60	9,10	8,90

*Source***:** Perspective monde, "Statistiques", 2013. http://perspective.usherbrooke.ca

We notice a decline in the unemployment rate from 2003 to 2010 but the decline is still less than that of Morocco which obtain 8.9%, while it is about 10% in Algeria. Meanwhile, Tunisia was experiencing a rise in unemployment in 2009 and 2010 with regard to its political situation. This requires additional efforts by Algeria on the human development index. The reasons for the growth of unemployment are:

- The school dropout. With 350,000 annually excluded, raises the issue of the labour market in search of skilled labour while paradoxically, Algeria imports a workforce in areas that do not require special skills, like the Chinese in the building and civil engineering works.
- Lower growth rates. According to the National Statistics Office of Algeria (ONS, 2013), the availability of jobs requires an annual growth of 6 to 7% in the period between 2010 and 2020, when it has not exceeded 3.5% the past years. This rate allows just preserving existing jobs without any possibility to create new (CHRIT, 2013).
- Increased population growth rate. With a volume reaching 808,000 inhabitants of natural growth of resident population in Algeria, equivalent to a rate of 2.16%, a level not seen since 1994 (ONS, 2013).

Figure 2 - Unemployment trends in Algeria, Morocco and Tunisia

Source: Perspective monde, Statistiques, 2013. http://perspective.usherbrooke.ca

3.2.2. Innovation

It is the measure of the level of research and technological development, reflecting the innovation and application of new techniques, through publications and patents, translated form of goods of high knowledge economic and technological performance. This indicator is quite low compared to other indicators and to other Arab countries with the same economic environment in the image of Tunisia and Egypt.

▪ *Patents*

Compared to the global innovation indicator in 2013, Algeria is ranked at 138th position. Statistics from the World Intellectual Property Organization (WIPO) indicate that Algeria has filed 15 patent applications in four years (2000-2003), through the unified filing system which Algeria acceded on 8 March 2000 representing 9.2% of all the 156 patent applications filed in Algeria during the same period, while a country like Israel has filed 4532 requests for the same period (Bakhti 2006).

▪ *Scientific articles and publications*

From 2003 to 2010, scientific research in Algeria represented 30.62% of the scientific production of the Arab Maghreb and 9.33% of the Arab world, knowing a substantial increase over the last decade. According to World Bank data, Algeria held the 4th position in 2012 and 2013 in the Arab world in the field of scientific publications in terms of number of publications, with a decrease of 0.25%. Although no expense has been devoted to scientific research between 2008 and 2013, the number of publications reached 20,000 in 2009.

Algeria has 600 researchers per million inhabitants, far from the international standards set in 2,000 researchers per million inhabitants. For instance, France has 3,000 researchers per million inhabitants, whereas Japan has 5600 (Ministry 2010).

This fact has a negative impact on the industry sector of high technological value and by extension, on Algeria's exports of products with high technological value of all finished products, while its exports of raw materials without any added value experiencing a rebound. The weakness of this indicator returns to the lack of interest in scientific research through grants for research and development and coordination between the university and the company.

3.3. Education and Human Skills

Upgrading of human resources and the concentration on the quality of education are among the key factors of value-added production, now the source of all competitive feature in the light of economic openness.

3.3.1. Human Development Index

The human development index (HDI) measures the development of states in relation to data such as life expectancy at birth and literacy rates. The human development index in Algeria has been improved from 1982 to 2002 (ANDI 2012), rising from 0.461 to 0.713 with an annual growth rate of 55%, reaching the highest level of human development in 2012, occupying the 93rd position (AISSAT 2013) between 187 countries and regions. The following table shows the progress of the Algerian human development index from 2000 to 2012.

Table 5 - Human Development Index in Algeria from 2000 to 2012

	Life expectancy	Expected years of schooling	Mean years of schooling	GDP per capita (in dollars)	Development Index
2000	70.1	10.2	5.9	5,783	0.634
2005	71.7	12.7	6.9	6,810	0.675
2010	72.9	13.6	7.6	7,262	0.709
2011	73.1	13.6	7.6	12,778	0.715
2012	73.4	13.6	7.6	12,778	0.715

	Life expectancy	Expected years of schooling	Mean years of schooling	GDP per capita (in dollars)	Development Index
2013	71	14	7.61	12,778	0.717

Source: United Nations, "Report on Human Development", United Nations, New York, USA, 2013.

Regarding the classification of developing countries by the considerable reduction of the difference between the human development index and its maximum value, the report on human development ranked Algeria among the top twenty countries in this category, having reduced this difference of 34.4% since 1994. In the North African region, Algeria with an index of 0.717 (93rd) comes after Libya ranked 55th with an index of 0.784, followed by Tunisia in the 90th position with an index of 0.721, Morocco to 129th position with an index of 0.617, ranked among the countries with medium human development. Finally Mauritania with low human development index 0.487 which occupies the 161th position (United Nations, 2013). The following figure shows the progress of the Algerian human development index from 1980 to 2013.
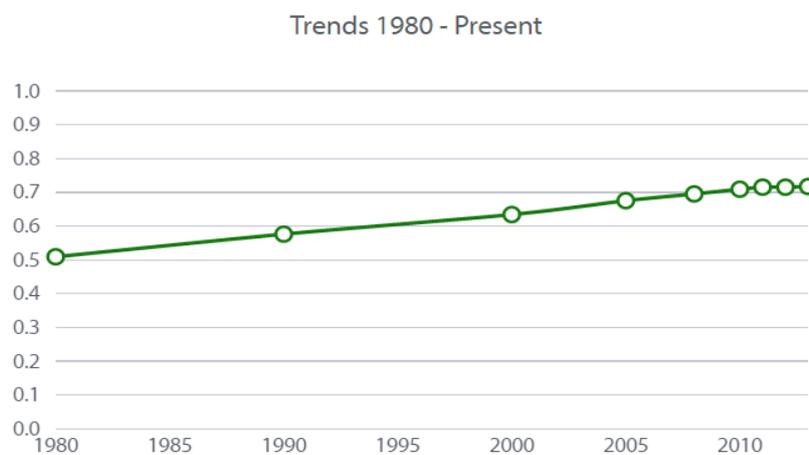
Figure 3 - Evolution of the Human Development Index from 1980 to 2013

Source: United Nations, "Report on Human Development", United Nations, New York, USA, 2013

We observe from Figure 3 that the human development index recorded a constant growth particularly from 2000 due to changes in oil revenues, constituting the majority of exports and not because of the adopted social policies. General manner, improved human development index is a positive point, but this index has yet to evolve more for countries that aspire to a leadership. Furthermore, this increase should be reflected in the level of knowledge of the human element through the analysis of literacy, secondary education and higher education.

3.3.2. Education in Algeria

The Human Development Report of 2013 indicates that the literacy rate in the category of 15 years and over is equivalent to 72.6%, with a school dropout rate estimated at 5% in primary education. The education satisfaction rate is estimated at 67.1% and despite the attention paid by Algerian authorities to education since independence, it is still lagging behind other countries, especially in North Africa like Tunisia. Furthermore, the satisfaction rate of education is subject to more quantitative and qualitative standards (UNESCO, 2009), as shown in the following table.

Table 6 - Education index in Algeria compared to other countries

	Adult literacy rate (% of 15 years and older)- 2005–2010	Satisfaction on education level	Gross Enrolment Ratio		
			Primary	Secondary	Higher
Qatar	96,3	69,9	103,0	94,0	10
Saudi Arabia	86,6	61,8	106,0	101,0	36,8
Algeria	72,6	67,1	110,0	95,0	30,8
Turkey	90,8	54,3	102,0	78,0	45,8
Tunisia	77,6	54,8	109,0	90,0	34,4

Source: United Nations, "Report on Human Development", United Nations, New York, USA, 2013.

3.4. Information and communication technology

Algeria has worked to develop its infrastructure in the field of information and communication technology (ICT) through the adoption of the strategic plan "Algeria Electronics 2013", based on 13 main areas including:

- Accelerating the use of ICT in public administrations, businesses and families
- Develop mechanisms and incentive procedures to allow families and small businesses to operate equipment, applications and networks ICT.
- Promote economic development based on knowledge in the field of production and export of software, services and equipment.
- Consolidate high quality installations with high speeds in terms of service and safety.
- Develop human skills through higher education and vocational training and teach ICT aspects to all classes of society. Expand research, development and innovation by enhancing search results and mobilizing skills.
- Adjust the National legal framework (laws and regulations) to enable the advent of e-government.
- Enhance international cooperation through the establishment of strategic partnerships.
- Establish mechanisms for evaluation and monitoring of all stages of development, implementation and execution of operations likely to achieve the objectives of the "Algeria Electronics' strategy.
- Take regulatory measures for coordination and response at national and inter-sectoral level.

It is possible to analyse the position of Algeria regarding this indicator by comparing it to other countries, as shown in the following table.

Table 7 - Comparative analysis of ICT indicators for Algeria and other countries in 2012

	Fixed-telephone Subscriptions per 1000 inhabitants	Fixed (wired) Internet Subscriptions per 1000 inhabitants	Mobile-cellular Subscriptions per 100 inhabitants
USA	444.1 (2012)	283.1 (2011)	954 (2012)
Turkey	187.3 (2012)	107 (2012)	914 (2012)
Saudi arabia	169.7 (2012)	69.5 (2012)	1874 (2012)
Morrocco	100.8 (2012)	21 (2012)	1199 (2012)
Libya	132.3 (2012)	129.5 (2009)	1557 (2012)
Egypt	106 (2012)	30.2 (2012)	1199 (2012)
Algeria	83.2 (2012)	5.6 (2005)	979 (2012)

Source: International Telecommunication Union (ITU). 2014. http://www.itu.int

Table 7 shows a comparison of ICT indicators between the USA, Egypt, Libya, Turkey, Morocco, Saudi Arabia and Algeria. The result is a net advantage of the United States relative to other countries especially in the field of Internet use and landline phone while Saudi Arabia is ranked first in

the use of mobile phones. Algeria is ranked last in the comparative study for this indicator where use of the Internet for example, is far from reaching the average (United Nations, 2011). This explains the position of Algeria to the global (ranked 131) and regional (ranked 11) for the index of network availability of 2013, with a percentage equal to 2.78%. This indicates that Algeria has not taken advantage of the resumption of the hydrocarbon sector like other oil-producing countries, i.e. Saudi Arabia. Although Algeria has launched "3G" in late 2013, it is still lagging behind compared with other countries at "4G" for many years. Studies have shown that increasing the number of "3G" subscribers by 10% in developed countries leads to a growth of 1.33% GDP. Hence the need to invoke the spirit of innovation and initiative make available the necessary infrastructure to build one of the pillars of knowledge in Algeria.

Conclusion

An economy based on knowledge is a growing economy happens to prevail vis-à-vis other international economies. This topic has been the subject of studies by international organizations including the World Bank that developed a methodology to assess the readiness of states to adhere to this new economy based on four pillars: the institutional and economic system, innovation, education and ICT. By applying the methodology of the World Bank on the Algerian economy, the study concludes that Algeria is still far from joining the knowledge economy, even in the Arab world, although its economy has advantages allowing it to go ahead and spend a consumer of knowledge products imported to a market covering local needs of that type of product.

The knowledge economy should adopt a set of policies and provide a favourable environment, attaching great importance to the human element and its development as a major source of capital for knowledge. Legislation should protect this knowledge capital through the rights of intellectual property, promoting innovation, origin of any competitive advantage. From the above, it is clear that Algeria suffers from certain weaknesses that prevent it from integrating the knowledge economy, including:

- Structural underdevelopment of the economy since growth rates are the result of the increase in the export of hydrocarbons and not the result of a truly productive economy.
- The large gap in the knowledge field of Algeria compared to developed countries, making it a unique consumer of knowledge products. Indeed, cooperation between universities and industry is non-existent, investment in research is almost absent, disfavouring any process of innovation which made from Algeria a country that excludes skills.
- Algeria has not been able to benefit from the growth in oil prices, to setup an infrastructure to provide widely and easily ICT. Internet remains inaccessible to many Algerians given their low purchasing power.

The creation of a knowledge-based growth in Algeria requires the implementation of a strategy for the long term, including the following elements:

- Establish a human development process that begins with education and teaching, to create a knowledge society capable of producing, using and disseminating knowledge.
- Facilitate access to knowledge, through the establishment of an ICT infrastructure and the widespread and encouraging of the use of modern communication tools in all aspects of life, especially those of education and training.
- Create an interactive relationship between the university and the industry, involving the private sector in funding scientific research and develop a legal framework protecting the knowledge produced in Algeria.

Acknowledgement

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HOW ECONOMIC AND FINANCIAL INTEGRATION AFFECTS FINANCIAL STABILITY IN SOUTH ASIA: EVIDENCE FROM PANEL COINTEGRATION ANALYSIS

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Abstract

Using the aggregate financial stability index (AFSI) which measures the gradual progression and changes in financial market stability, this paper conducts an empirical evaluation of the impact of financial and economic integration on the financial stability for South Asia. All selected variables (AFSI, economic integration, financial integration, economic growth, government consumption expenditure) are found to be integrated of order one, cross-sectionally dependent and cointegrated in South Asian panel. Long-run results estimated by applying fully modified OLS (FMOLS) and pooled mean group (PMG) estimator techniques suggest that financial integration and economic integration are not helpful in increasing the financial stability of South Asian financial markets. The findings of the study offers new implications for monetary authorities and policy makers in developing countries.

Keywords: financial stability; economic integration; financial integration; AFSI; South Asia

JEL Classification: F15; F36; G01

1. Introduction

Financial stability is said to exist when financial system is able to utilize capital on most profitable investment projects without major disturbances (Reserve bank of India 2013). In other words, a financial system is stable only when it is capable of encouraging the performance of economy and of fighting financial disruptions that arise endogenously or as a result of adverse and unanticipated events (Schinasi 2004). Practically, the stability of financial markets encourages and ensures the sustainability of integration process and reduces at the same time the risk of asymmetric shocks. In contrast, financial turmoil negatively effects the process of economic and financial integration.

The literature has provided various alternative definitions of financial integration. Here, we present the most commonly used definition of Baele *et al.* (2004) and Weber (2006) i.e. the market for a given set of financial instruments and services is fully integrated if all potential market participants have the same relevant characteristics: (1) they follow a same set of rules in their decisions relating to financial instruments and services; (2) they have equal access to same set of financial instruments and services; and (3) they treated equally when they participate in the market. Most of the definitions of financial integration are closely linked to the law of one price. The law of one price states that assets having identical risks and returns should be priced identically regardless of where they are transacted.

According to McCarthy (1996) economic integration have two main elements: (1) removal of barriers to economic and business activities; and (2) involvement of participants in an economic activity without any discrimination. Economic integration may take different forms. According to Balassa (1962), the process of economic integration is divided into four different stages. The first is a Free Trade Area (FTA), second is a Customs Union (CU), third is a Common Market (CM), and fourth is an Economic Union. Panagariya (2000, 288) used the term PTA which stands for Preferential Trade Area, Preferential Trade Agreement or Preferential Trade Arrangement. PTA is a wider term that can be used to describe FTAs, CUs and arrangements involving partial trade preferences.

The economic and financial integration around the globe increased significantly during the late 1980s and early 1990s. Globalization and technological advances in payment and communication system have bring the countries closer to each other, accelerating the volume of their trade and integrating their financial markets. The developing countries of the world are adopting more prudent

policies to open up their economies and eliminating capital control barriers to attract foreign capital and increase the volume of merchandize trade.

South Asian countries have started to opening up their economies in the late 1980s. South Asia is much more integrated in the global world today than it was in 1980. Much of the fabulous economic growth that the region experienced in late 1990s and 2000s is the result of trade and financial market liberalization policies pursued by most of South Asian countries. Trade as percentage of GDP more than doubled between 1990 and 2010 in India and Bangladesh. In spite of trade liberalization policies, trade as a percentage of GDP in South Asia is still lower than that of other developing region. In South Asia, trade to GDP ratio was 45.49 percent in year 2012 which is far below the corresponding average of 87.23 percent of East Asia and Pacific and 66.32 percent for low and middle income countries (World Bank, 2012).

The objective of current paper is to explore the impact of economic and financial integration on the financial stability of South Asia. To do so, we first develop an aggregate financial stability index (AFSI). The AFSI involves the aggregation of sub-indices covering financial sector development, vulnerability and soundness. Trade openness and the sum of foreign assets and liabilities as percentage of GDP are used to measure economic integration and financial integration, respectively. For empirical estimation, the study applies panel cointegration techniques developed by Pedroni (2001) to examine cointegration between variables while causality analysis is conducted by applying a modified version of Granger causality test developed by Dumitrescu and Hurlin (2012). The Fully Modified Ordinary Least squares (FMOLS) and Pooled Mean Group (PMG) estimators are used to show linear relationship between financial stability, economic integration and financial integration in long-run.

The rest of the paper is organized as follows: Section 2 presents literature review; Section 3 describes the procedure of AFSI; Section 4 provides methodology; Section 5 explains empirical results and their interpretation and last Section 6 concludes the empirical findings.

2. Review of literature

Empirically, economists seem to agree that financial integration increases the incidence of banking and currency crisis, thus lead to financial fragility. Demirguc-Kunt and Detragiache (1998) and (1999) tested the financial liberalization and financial instability hypothesis using the data of wide range of developed and developing countries. Dummy variable is used to represent banking crisis which takes the value 1 for crisis and 0 for absence of crisis. Empirical results estimated by employing multivariate logit model indicates that financial liberalization positively and significantly increased the probability of banking crisis in sample countries.

Cerra and Saxena (2007) showed that crisis significantly reduces the overall supply of finance which depresses the level of growth. However, the authors found no role of financial liberalization in aggravating crisis. On the other hand, financially open economies experiences have a smaller degree of decline in financial supply and thus, the smaller effect of business cycle on financial development and growth channels. In other words, financial integration does not stop the flow of financial supply even during crisis and does not disturb financial stability in greater amount. Ho (2009) discussed the financial integration position of Macao using simple statistical analysis. The results confirmed that Macao has high degree of financial integration with the rest of the world. Moreover, financial integration promotes financial stability in Macao but at the same time it limits the autonomy of financial institutions.

Fowowe (2010) explored the impact of financial liberalization on financial instability in Nigeria by applying auto-regressive distributed lag (ARDL) model. To measure financial instability, the author used standard deviation of the ratio of domestic credit provided by banking sector. Financial integration is measured by a composite index derived by using principle component analysis (PCA) technique. The index comprises privatization and restructuring of banks, interest rate reform, strengthening of prudential regulation, capital account liberalization, stock market liberalization and free entry of banks. The result showed that financial integration reduces financial instability in Nigeria both in long-run and short-run.

Vogel and Winkler (2011) investigated the role of foreign banks during financial crisis in emerging economies. The author used the difference of the average of pre-shock flows and post shock flows to measure instability in bank flows. Foreign bank role is measured by share of assets held by

foreign banks. Results estimated by applying seemingly unrelated regression system concludes that foreign banks provided additional support during crisis to maintain stability in foreign markets. Albulescu (2011) analyzed the impact of financial instability on economic and financial integration of Central and Eastern European countries (CEECs) using panel data fixed effect model. The author used trade openness and trade intensity index to measure economic integration while asset share of foreign-owned banks and correlation index of interest rate are used to measure financial integration. Financial instability is measured by financial instability index comprises 15 individual indicators relating to financial vulnerability, macroeconomic condition and banking fragility. Empirical results implie that financial and economic integration of CEECs country significantly depend on financial market stability.

Brezigar-Masten *et al.* (2011) found that financially integrated economies does not suffer much in financial crisis due to less disruption in the supply of foreign capital. The authors used panel data of 64 countries and applied GMM by Arellano and Bond for empirical analysis. Two different indicators: stock of total foreign assets and liabilities to GDP ratio and stock of total foreign assets and liabilities without foreign direct investments are used to measure financial integration. Babetskii *et al.*, (2013) examined the process of financial integration in Czech Republic, Hungary, Poland, Sweden and UK to Euro area particular during the time of financial instability. Money market, foreign exchange market and government bond market weekly data for the period 1999 to 2010 are used to measure financial integration. The empirical results did not support the significant effect of financial crisis on financial stability in Czech Republic, Hungary, Poland and Sweden.

3. The construction of aggregate financial stability index for South Asian economies financial system

The aggregate financial stability index (AFSI) is one of the comprehensive quantitative method used to measure the stability of a financial system. It has several advantages such as high transparency, easier access to statistical data, simple calculation procedure and the likelihood to forecast financial stability level. Many researchers like Illing and Liu (2003), Hanschel and Monnin (2005), Gersl and Hemanek (2006), Van den End (2006), Rouabah (2007), Morris (2010), Cheang and Choy (2011) and Albulescu *et al.* (2013) have developed financial stress index but it became more popular when it was used by International Monetary Fund (IMF) in 2008 or European Central Bank (ECB) in 2010.

For South Asian economies, 15 individual indicators are selected for inclusion in the AFSI. These indicators are classified into three categories: financial markets, banking market and vulnerability indicators (see Table 1). The data of 15 individual indicators over the period 1980-2012 is taken from World Bank financial structure dataset, International Financial Statistics of IMF, State Bank of Pakistan, Reserve Bank of India, Central Bank of Bangladesh, Central Bank of Sri Lanka, Nepal Rastra Bank and from various financial stability reports.

The financial market indicators measures financial deepening of South Asian region. Indicators included in financial vulnerability measure macroeconomic condition and funding structure of banking institutions. The sound macroeconomic condition captures the soundness of financial system and its capability against potential shocks. Finacial soundness indicators are used to measure banking system fragility. These indicators are proposed by the IMF and used by various international finacial institutions to access the soundness of finacial sytem.

Table 1 - Financial stability indicators

Individual Indicators		Expected impact on financial stability
(i) Financial market indicators (fmi)		
Domestic credit to GDP (%)	*dc*	+
Interest rate spread	*rs*	-
Stock market capitalization to GDP (%)	*smc*	+

Individual Indicators		Expected impact on financial stability
(ii) Financial vulnerability indicators (*fvi*)		
Fiscal deficit (% of GDP)	*fd*	-
Current account deficit (% of GDP)	*cad*	-
Real effective exchange rate (change)	*reer*	-
Public debt to GDP ratio	*pd*	-
International reserve to import ratio	*irm*	+
Non-government credit to total credit	*ngc*	+
M2 to Foreign exchange reserve ratio	*mfr*	+
M2 multiplier	*mk*	+
(iii) Financial Soundness indicators (*fsi*)		
Return on assets	*ra*	+
Bank capital to asset ratio	*bca*	+
Liquid asset to total asset	*la*	+
Bank regulatory capital to risk weighted assets	*brc*	+

The above mentioned individual indicators are available on yearly basis. Before combining all the individual indicators in to one single aggregate index, it is necessary to be put on a common scale. For this purpose, all individual indicators are normalized so that they have common variance. Various methods are used for normalization but statistical normalization and empirical normalization are most frequently used in the construction of aggregate index.

The above mentioned individual indicators are available on yearly basis. Before combining all the individual indicators in to one single aggregate index, it is necessary to be put on a common scale. For this purpose, all individual indicators are normalized so that they have common variance. Various methods are used for normalization but statistical normalization and empirical normalization are most frequently used. In this study, we use statistical normalization procedure.

The statistical normalization procedure convert indicators in to a common scale with a mean of zero and variance of one. Zero mean value of indicators eliminates the problem of aggregation distortions arises due to differences in indicators' mean. Standard deviation is used for scaling the indicators. Statistical normalisation is computed by applying the following formula:

$$Z_t = \frac{(X_t - \overline{X})}{S} \qquad (3.1)$$

Z_t is called standard normal distribution with zero mean and unit variance, N(0,1). X_t is the value of indicator at time t. $\overline{X}$ and S is the value of mean and standard deviation respectively of indicator x analyzed in the period t. All individual indicators are normalized so that a positive value indicate improvement in financial stability and negative value indicate deterioration in financial stability.

After normalization of individual indicators, the next step is to assign weight to individual indicators. We can choose either to assign the equal weight to all the variables or to apply a different weight based on the decision making criteria. The standard procedure consists in assigning the equal

weight to all the variables which are included in the aggregate index. This study utilizes the variance equal weighting method for the construction of aggregate index.

The normalized indicators are then combined into their respective sub-indices using the folowing formulas:

$$\text{Financial market index, } \bar{m} = \frac{\sum_{i=1}^{3} fdev}{3} \qquad (3.2)$$

where $i = dc, rs, smc$

$$\text{Financial vulnerability index, } \bar{V} = \frac{\sum_{j=1}^{8} fv}{8} \qquad (3.3)$$

where: $j = fd, cad, reer, pd, irm, ngc, mfr, mk$

$$\text{Financial soundness index, } \bar{f} = \frac{\sum_{f=1}^{4} fs}{4} \qquad (3.4)$$

where: $f = ra, bca, la, brc$

In constructing the AFSI equal weights are assigned to each individual indicator while unequal weights are assigned to sub-indices. Most heavily weights are assigned to vulnerability index and the least weights to financial market. Vulnerability index receive highest weights because it capture a wide range of risks in macroeconomic environment and bank specific factors.

The Final step is construction of AFSI of South Asian region. For this purpose, the AFSI for each country is weighted with the country GDP to South Asia GDP. A weighted mean is calculated based on the importance of each country in the South Asian region.

$$AFSI_{t,S.ASIA} = \sum_{z=1}^{15} AFSI_{t,zr} \times \frac{GDP_{t,z}}{GDP_{t,S.ASIA}} \qquad (3.5)$$

where $AFSI_{t,S.ASIA}$ is the south Asian region aggregate financial stability index for year t; $GDP_{t,z}$ is the GDP of country z for year t and $GDP_{t,S.ASIA}$ is the GDP of South Asian region for year t.

Figure 1 shows the trends in AFSI of South Asian where positive values indicates the periods of financial stability and negative values indicates the opposite case.
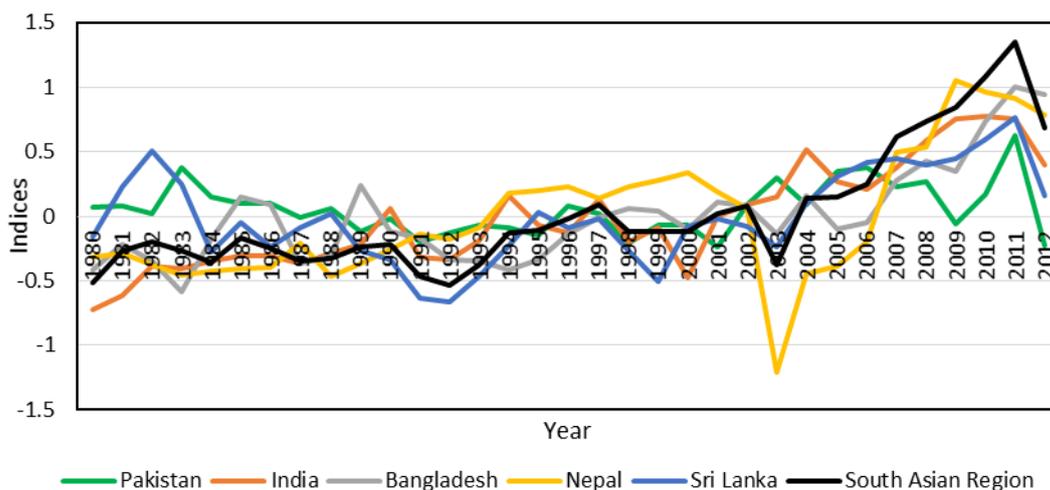
Figure 1 – AFSI for South Asian Region

4. Methodology

4.1. Explanatory variables and their data sources

Trade openness is used to measure economies integration of the South Asian economies. Lane and Milesi-Ferretti (2003) stated that trade openness reflect the integration process due to various reasons. First, trade in goods and services directly results in corresponding financial transaction such as trade credit, transportation costs and export insurance. Second, the trade openness may increase the willingness to conduct cross border transactions, reducing financial home bias. The classical method for computing the trade openness (TO) is to use the commercial transactions (exports and imports) to GDP ratio.

$$TO = \frac{X + M}{GDP} \qquad (4.1)$$

To measure financial integration, a much more complex process, we use sum of stock of foreign assets and liabilities as a percentage of GDP. Brezigar-Masten *et al.* (2008) and Brezigar-Masten *et al.* (2011) noted that such measures are close to the theoretical concept of financial integration because they emphasize both the ability of foreigners to invest into and lend to a country, and domestic agents to borrow from and invest abroad. Moreover, these types of measures are very robust to other, more disaggregate, measures of financial integration (FDI, portfolio, etc.).

$$FINT = \frac{FASSETS + FLIABLITIES}{GDP} \qquad (4.2)$$

Following Demirguc-Kunt and Detragiache (1998), the other explanatory variables such as GDP growth and government consumption to GDP ratio are selected. GDP growth rate is proxy for economic growth. The deterioration of economic growth affects the banks' activity and consequently, the stability of financial system. Government consumption to GDP ratio is a proxy for fiscal policy of government. A government whose fiscal position is in a bad shape may not be able to bail out banks experiencing difficulties and this results in an increase in financial imbalances as more banks fall into difficulties.

Five South Asian countries: namely, Pakistani, India, Bangladesh, Sri Lankan and Nepal are selected on the basis of data availability. The data set of trade openness, GDP growth, and government consumption expenditures to GDP ratio is obtained from World Bank's World Development Indicators database. The source of financial integration measure is the updated and extended version of dataset constructed by Lane and Milesi-Ferretti (2007).

4.2. Econometric model

The above discussion leads to formulate following econometric model for empirical specification:

$$AFSI_{it} = \beta_0 + \beta_1 FINT_{it} + \beta_2 EINT_{it} + \beta_3 \ln EG_{it} + \beta_4 GEXP_{it} + \varepsilon_{it} \qquad (4.3)$$

where: AFSI = aggregate financial stability index;
   FINT = financial integration;
   EINT = economic integration;
   EG = economic growth;
   GEXP = government consumption expenditure;
   ε = error term.

4.3. Econometric techniques

4.3.1. Panel unit root and cross-sectional dependence tests

The first step in our empirical methodology is to test the order of integration of the variables. Levin *et al.*, (2002) proposed a panel unit root test (LLC) that assumes common unit root process so that autoregressive coefficients are homogenous across cross-sections. Recently panel data econometric literature has turned its attention towards testing for and correcting cross-sectional dependence problem. To test for cross-sectional dependence, the Pesaran (2007) and Freidman (1937) cross-sectional dependence (CD) tests are employed. The null hypothesis of the test is cross-sectional

independence. The results of cross-sectional independence tests are provided in Appendix Table-I. The null of cross-sectional independence is rejected in our present case. Pesaran (2007) argued that when cross-sectional dependence is high, LLC tests tend to over reject the null hypothesis. More recently some panel unit roots tests have been developed that relax this independence assumption. Among them the most commonly used test is the cross-sectional Augmented Dickey-Fuller (CADF) test of Pesaran (2007). CADF test is based on the IPS test, allows for the cross-sectional dependence to be caused by unobservable factors, and is valid for both unbalanced panel and balanced panel.

4.3.2. Panel cointegration tests

Advance panel cointegration tests can be expected to have high power than the traditional cointegration tests. The tests applied for long-run examination are developed by Pedroni (2001 and 2004) Pedroni start their cointegration procedure by estimating the residual from the hypothesized long-run regression of the following form:

$$x_{i,t} = \alpha_i + \rho_i t + \beta_{1i} Z_{1i,t} + \ldots\ldots\ldots + \beta_{mi} Z_{mi,t} + \mu_{it} \tag{4.4}$$

where x and Z are assumed to be integrated of order one. The specific intercept term α_i and slope coefficients $\beta_{1i}, \beta_{2i}, \ldots\ldots, \beta_{mi}$ vary across individual member of the panel. Pedroni (1999 and 2004) defines two sets of statistics to test for cointegration. The first set of statistics is based on pooling the residuals along the within dimension of the panel. These statistics are as follows:

- Panel v-Statistic: $Z_v \equiv T^2 N^{3/2} \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\kappa}_{11,i}^{-2} \hat{\mu}_{it-1}^2 \right)^{-1}$;

- Panel ρ-statistic: $Z_p \equiv T\sqrt{N} \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\kappa}_{11,i}^{-2} \hat{\mu}_{it-1}^2 \right)^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\kappa}_{11,i}^{-2} \left(\hat{\mu}_{it-1} \Delta\hat{\mu}_{it} - \hat{\lambda}_i \right)$;

- Panel t-statistic (non-parametric): $Z_t \equiv \left(\tilde{\sigma}^2 \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\kappa}_{11,i}^{-2} \hat{\mu}_{it-1}^2 \right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\kappa}_{11,i}^{-2} \left(\hat{\mu}_{it-1} \Delta\hat{\mu}_{it} - \hat{\lambda}_i \right)$;

- Panel t-statistic (parametric): $Z_t^* \equiv \left(\tilde{s}_{N,T}^{*2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\kappa}_{11,i}^{-2} \hat{\mu}_{it-1}^2 \right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\kappa}_{11,i}^{-2} \hat{\mu}_{it-1}^* \Delta\hat{\mu}_{it}^*$.

The second set of statistics is based on pooling the residuals along the between dimensions of the panel. It allows heterogeneous autocorrelation parameter across members. The statistics are expressed as:

- Group ρ-statistic: $\tilde{Z}_p \equiv TN^{-1/2} \sum_{i=1}^{N} \left(\sum_{t=1}^{T} \hat{\mu}_{it-1}^2 \right)^{-1} \sum_{t=1}^{T} \left(\hat{\mu}_{it-1} \Delta\hat{\mu}_{it} - \hat{\lambda}_i \right)$;

- Group t-statistic (non-parametric): $\tilde{Z}_t \equiv N^{-1/2} \sum_{i=1}^{N} \left(\hat{\sigma}_i^2 \sum_{t=1}^{T} \hat{\mu}_{it-1}^2 \right)^{-1/2} \sum_{t=1}^{T} \left(\hat{\mu}_{it-1} \Delta\hat{\mu}_{it} - \hat{\lambda}_i \right)$;

- Group t-statistic (parametric): $\tilde{Z}_t^* \equiv N^{-1/2} \sum_{i=1}^{N} \left(\sum_{t=1}^{T} \tilde{s}^{*2} \hat{\mu}_{it-1}^{2*} \right)^{-1/2} \sum_{t=1}^{N} \hat{\mu}_{it-1}^* \Delta\hat{\mu}_{it}^*$.

The group mean of these statistics is computed by individual time series statistics. The asymptotic distribution of each of these statistics is described as follows:

$$\frac{X_{N,T} \mu \sqrt{N}}{\sqrt{e}} N(0,1) \tag{4.5}$$

where $X_{N,T}$ is the corresponding from of the test statistics while μ and e are the mean and variance of each test respectively. Panel *v* statistics diverges to positive infinity under the alternative hypothesis. Therefore, it is a one sided test where large positive values reject the null of no

cointegration. The remaining statistics diverge to negative infinity, which means that large negative values reject the null hypothesis.

4.2.3. Estimation of panel cointegration regression

If all the variables are cointegrated, the next step is to compute the associated cointegration parameters. In the presence of cointegration, the application of OLS produced biased and inconsistent estimated. As a consequences, several estimation techniques have been proposed. For example, Kao and Chiang (2000) argued that their panel Dynamic OLS (DOLS) estimators (that pools the data along the within-dimension of the panel) are performed well in cointegrated panels and especially in small samples. However, the panel DOLS does not consider the importance of cross-sectional heterogeneity in the alternative hypothesis. To allow for cross-sectional heterogeneity in the alternative hypothesis, Pedroni (2000; 2001) proposed the group mean Fully Modified OLS (FMOLS) estimator for cointegrated panels. This technique generates consistent estimates in small samples and does not suffer from large size distortions in the presence of endogeneity and heterogeneous dynamics. The panel FMOLS estimators for the coefficient β is defined as:

$$\hat{\beta} = N^{-1} \sum_{i=1}^{N} \left(\sum_{t=1}^{T} (y_{it} - \bar{y})^2 \right)^{-1} \left(\sum_{t=1}^{T} (y_{it} - \bar{y}) \right) z_{it}^* - T\hat{\eta}_i \tag{4.6}$$

where: $z_{it}^* = (z_{it} - \bar{z}) - \dfrac{\hat{L}_{21i}}{\hat{L}_{22i}} \Delta y_{it}$, $\hat{\eta}_i \equiv \hat{\Gamma}_{21i} + \hat{\Omega}_{21i}^0 - \dfrac{\hat{L}_{21i}}{\hat{L}_{22i}}(\hat{\Gamma}_{22i} + \hat{\Omega}_{22i}^0)$ and $\hat{L}_i$ is a lower triangular decomposition of $\hat{\Omega}_i$.

For robustness check, we have applied pooled mean group (PMG) technique developed by Pesaran *et al.* (1999). Pooled mean group (PMG) estimator technique consists of averaging separate estimates for each group in panel. This technique provides consist estimates of the parameters' averages (Pesaran *et al.* 2001). It assumes the parameters are independent across cross-sections and does not consider potential homogeneity between cross-sections. It also allows the short-run coefficients to differ across groups while long-run parameters to be equal between countries. Further, in contrast to FMOLS, the PMG estimator method estimates the adjustment dynamics between the short-run and the long-run. The long-run relationship between variables is expected to be identical across countries but the short-run coefficients are expected to be differ across countries. Further, Hausman test is applied to test the null hypothesis of homogeneity in the long-run coefficients.

4.2.4. Panel Causality Test

To test causality, we employed the Dumitres.cu and Hurlin (2012) panel causality test which is the simplified version of Granger (1969) non-causality test for heterogeneous panel data models with fixed coefficients. It takes into account the two dimensions of heterogeneity: the heterogeneity of regression model used to test the Granger causality and the heterogeneity of the causal relationships. To test causality, we consider the following model:

$$z_{it} = \alpha_i + \sum_{m=1}^{M} \gamma_i^{(m)} z_{i,t-m} + \sum_{m=1}^{M} \pi_i^{(m)} y_{i,t-k} + \varepsilon_{it} \tag{4.7}$$

In the above equation, we assume that lag order of M are homogenous for each cross-section units of the panel. We also allow the autoregressive parameter $\gamma_i^{(m)}$ and the regression coefficients $\pi_i^{(m)}$ to be varied across cross-sections of the panel. Under the null hypothesis, we assume that there is no causality relationship for any of the cross-sectional unit of the panel. This assumption is called the Homogenous Non-Causality (HNC) hypothesis and is defined as:

$$H_0 : \pi_i = 0 \qquad \forall_i = 1, 2, \ldots, N$$

The alternative hypothesis is called as Heterogeneous Non-Causality (HENC) hypothesis. The alternative hypothesis is as follows:

$$H_a : \pi_i = 0 \qquad \forall_i = 1, 2, \ldots, N_1$$

$$\pi_i \neq 0 \qquad \forall_i = N_1 + 1, \ldots, N$$

We assume that there are $N_1 < N$ individuals processes with no causality from y to z. N_1 is unknown but it provides the condition $0 \leq N_1 / N < 1$. We propose the average statistics $W_{N,T}^{HNC}$, which is related with the Homogenous Non-Causality (HNC) hypothesis, as follows:

$$W_{N,T}^{HNC} = \frac{1}{N} \sum_{i=1}^{N} W_{i,T} \qquad (4.8)$$

where $W_{i,T}$ indicates the individual Wald test statistics for the ith cross-sectional unit corresponding to the individual test. Under the null hypothesis of non-causality, each individual Wald test statistic converge to chi-squared distribution with M degree of freedom for $T \rightarrow \infty$. The standardized test statistics $Z_{N,T}^{HNC}$ for $T, N \rightarrow \infty$ is as follows:

$$Z_{N,T}^{HNC} = \sqrt{\frac{N}{2M}} (W_{N,T}^{HNC} - M) \rightarrow N(0,1) \qquad (4.9)$$

Further information about these statistics can be found in the study of Dumitrescu and Hurlin (2012).

5. Empirical results and discussions

The results of IPS and LLC unit root tests with constant and, constant and trend are reported in Table-2. The empirical findings reveals that all variables are non-stationary at level and found to be stationary at their 1st difference. This implies that aggregate financial stability index ($AFSI_{it}$), economic integration ($EINT_{it}$), financial integration ($FINT_{it}$), economic growth (EG_{it}) and government consumption expenditures ($GEXP_{it}$) are integrated at I(1) in South Asian panel. However, Table 2A reported in appendix indicates that variables exhibit cross-sectional dependence properties. Due to the problem of cross-sectional dependence, Pesaran CIPS test for unit root is applied on each variable. Table-3 which displays the results of CIPS test provides strong evidence to counter the prior belief that all five variables analyzed here are I(1) in South Asian countries.

Table 2 - LLC and CADF Panel Unit Root Test Results

Variables	At level				At 1st Difference			
	η_i	P-value	η_t	P-value	η_i	P-value	η_t	P-value
$AFSI_{it}$	1.092	0.862	0.636	0.737	-5.504	0.000	-3.664	0.000
$FINT_{it}$	-0.537	0.295	1.983	0.976	-5.237	0.000	-5.141	0.000
$EINT_{it}$	1.620	0.947	0.664	0.921	-4.167	0.000	-2.776	0.002
EG_{it}	-0.276	0.390	0.857	0.804	-11.43	0.00	-9.915	0.000
$GEXP_{it}$	0.488	0.687	1.010	0.843	-3.340	0.000	-3.105	0.009
CADF Unit Root Test								
$AFSI_{it}$	-1.895	0.392	-1.607	0.969	-4.038	0.000	-4.021	0.000
$FINT_{it}$	-1.779	0.501	-2.135	0.699	-4.071	0.000	-3.913	0.000
$EINT_{it}$	-1.846	0.438	-1.536	0.980	-3.185	0.000	-3.154	0.019
EG_{it}	-1.747	0.532	-2.332	0.508	-4.322	0.000	-4.310	0.000
$GEXP_{it}$	-1.550	0.708	-2.661	0.208	-3.474	0.000	-3.353	0.005

Note: η_i represent intercept and η_t represent intercept and trend.

The unique order of integration of the variables helps us to apply panel cointegration techniques to examine long run relationship between variables. The results of Pedroni (2004) panel cointegration tests are reported in Table 3. The tests present strong evidence that in South Asian panel all the variables (financial stability, economic integration, financial integration, economic growth and government consumption expenditures) are cointegrated over the period 1980-2012.

Table 3 - Pedroni panel cointegration test results

Models	Statistics	P-value	Statistics	P-value
	No Trend		Trend	
Panel υ-statistic	0.390	0.348	-0.470	0.681
Panel σ-statistic	-0.243	0.404	0.342	0.633
Panel ρρ-statistic	-1.744	0.040	-1.551	0.060
Panel adf-statistic	-2.509	0.006	-2.217	0.013
Group σ-statistic	0.268	0.606	0.819	0.793
Group ρρ-statistic	-2.474	0.006	-1.723	0.042
Group adf-statistic	-3.760	0.001	-2.804	0.002

*Variables***:** $AFSI_{it}, FINT_{it}, EINT_{it}, EG_{it}, GEXP_{it}$)

Once the cointegration between carbon emissions and its covariates is confirmed, the long-run coefficients are estimated in the next step. Table 4 describes the result of long-run coefficients estimated by applying FMOLS technique. The coefficient of financial integration is negative and significant in South Asian panel. The result implies that foreign banks in developing countries are a key mechanism for transmitting crisis from advanced to developing countries (Peek and Rosengren 2007; IMF 2009) and increasing financial fragility. In addition, financial integration leads to the development of equity market, but only when a threshold level of general development of legal system and institutions have been attained (Rajan and Zingales 2003; Chinn and Ito 2006). In South Asian countries, institutions and legal system is still under developed. As a result, we find the negative impact of financial integration on financial stability. Our results are consistent with the studies of Demirguc-Kunt and Detragiache, (1998) and (1999); Reinhart and Kaminsky, (1999); Dell'Ariccia and Marquez (2005) that have found financial integration as a determinants of financial fragility. Similarly, the effect of economic integration on financial stability is found to be negative in all countries. Our results are in line with the findings of Do and Levchenko (2004), that more trade in developing countries should lead to slower financial development and in turn financial stability, as these countries import financially intensive goods rather than develop their own financial system. With respect to control variables, the coefficient of economic growth and government consumption expenditures are found to be positive, thus indicates that sustainable level of economic growth and a balanced fiscal policy can play a significant role in increasing financial stability for South Asian region.

Table 4 - FMOLS Test Results (Dependent variable: $AFSI_{it}$)

Variables	$FINT_{it}$	$EINT_{it}$	EG_{it}	$GEXP_{it}$
Coefficient	-0.002	-0.021	0.030	0.034
P-value	0.060	0.000	0.000	0.000

Table 5 presents the results of long-run and short-run coefficients. We emphasize the results obtained from PMG estimators, which we prefer due to its advantage in terms of consistency and efficiency over other panel error correction estimators. For comparison purpose, we also display the results obtained with mean group (MG) and dynamic fixed effect (DFE) estimators. PMG results show

that economic integration and financial integration negatively and significantly impact financial stability. The effect of other explanatory variables like economic growth and government consumption expenditures on financial stability are found to be positive and significantly in long-run. These results validate the findings of FMOLS. Hausman test is applied to test the null of homogeneity across countries based on the comparison between PMG and MG estimators. The P-value of Hausman test shows that homogeneity restriction is not rejected jointly for all parameters. Hence, the PMG estimation technique is appropriate for the estimation of long-run coefficients in South Asian countries.

Table 5 - PMG, MG and DFE Results

(Dependent variable**:** $AFSI_{it}$)**;** Dynamic specification: ARDL (2, 2, 3, 3, 3)

Variables	PMG		MG		DFE	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
Long-run Coefficients						
$FINT_{it}$	-0.006	0.002	-0.008	0.046	0.005	0.492
$EINT_{it}$	-0.019	0.000	-0.018	0.061	-0.017	0.076
EG_{it}	0.042	0.068	0.004	0.948	0.012	0.791
$GEXP_{it}$	0.123	0.000	0.160	0.295	0.071	0.347
Short-run Coefficients						
EC_{it-1}	-0.564	0.004	-0.714	0.000	-0.361	0.000
$\Delta AFSI_{it}$	-0.071	0.703	0.295	0.002	-0.032	0.796
$\Delta FINT_{it}$	0.0003	0.969	-0.007	0.332	-0.002	0.429
$\Delta FINT_{it-1}$	-0.0002	0.950	-0.005	0.303	-0.001	0.727
$\Delta EINT_{it}$	-0.013	0.518	-0.012	0.244	0.005	0.592
$\Delta EINT_{it-1}$	-0.004	0.730	-0.009	0.478	0.002	0.873
$\Delta EINT_{it-2}$	-0.027	0.060	-0.041	0.009	-0.006	0.595
ΔEG_{it}	-0.018	0.087	0.011	0.792	0.003	0.807
ΔEG_{it-1}	0.007	0.688	0.003	0.899	0.010	0.587
ΔEG_{it-2}	0.004	0.652	0.002	0.869	0.009	0.243
$\Delta GEXP_{it}$	-0.061	0.367	0.074	0.353	0.018	0.386
$\Delta GEXP_{it-1}$	-0.036	0.623	-0.027	0.577	0.003	0.904
$\Delta GEXP_{it-2}$	0.122	0.267	-0.096	0.368	0.029	0.313
Constant	-1.325	0.006	-1.737	0.043	-0.612	0.074
Hausman Test	3.53		0.473			

The error correction term (EC_{it-1}) shows adjustment from short-run to long-run dynamics, when there is homogeneity in all variables: $AFSI_{it}$, $EINT_{it}$, $FINT_{it}$, EG_{it} and $GEXP_{it}$ in South Asian panel. The error correction term has negative sign and is significant at 1% level in all estimated models. This result shows that there is an adjustment dynamic from short-run to long-run equilibrium in AFSI, financial integration, economic integration, economic growth and government expenditures relationship in South Asian region. Further, the effect of all coefficient on financial stability is found to be insignificant in short-run.

The presence of cointegration between the series leads us to investigate the direction of causality. In doing do, we have applied Dumitrescu and Hurlin (DH) panel causality and results are reported in Table-6. The DH test of causality is applied on first differenced series because all variables are stationary at first difference i.e. I(1). The empirical results of DH causality validates only the evidence of unidirectional causality running from economic growth to financial stability. The

neutral effect exists between financial stability and economic integration and between financial stability and financial integration i.e. no causality exists between these variables in South Asian panel.

Table 6 - The Result of DH panel causality Test at 1st Difference

Direction of Causality	$W_{N,T}^{HNC}$	$Z_{N,T}^{HNC}$	P-Value
$FINT_{it} \rightarrow AFSI_{it}$	0.914	-0.187	0.851
$AFSI_{it} \rightarrow FINT_{it}$	0.741	-0.464	0.642
$EINT_{it} \rightarrow AFSI_{it}$	1.008	-0.095	0.924
$AFSI_{it} \rightarrow EINT_{it}$	1.051	-0.035	0.971
$EG_{it} \rightarrow AFSI_{it}$	2.984	3.024	0.032
$AFSI_{it} \rightarrow EG_{it}$	0.797	-0.387	0.698
$GEXP_{it} \rightarrow AFSI_{it}$	0.285	-1.095	0.273
$AFSI_{it} \rightarrow GEXP_{it}$	0.227	-1.176	0.239

6. Concluding remarks and policy implications

This study explores the relationship between financial stability, economic integration and financial integration in South Asia using annual data over the period 1980-2012. For empirical analysis, we have employed panel estimation techniques that are robust to both cointegration and cross-sectional dependence.

Our result indicates that all variables are integrated at I(1) and cross-sectionally dependence. The Pedroni cointegration and Johansen Fisher Panel cointegration approaches confirmed the cointegration relationships between financial stability, economic integration, financial integration, economic growth and government consumption expenditures in our selected panel of South Asian countries. The FMOLS and PMG estimates suggest (i) financial integration and economic integration are negatively impacting financial stability (ii) economic growth and government consumption expenditure are helpful for increasing the stability of financial. Finally, the study applied Dumitrescu and Hurlin (DH) causality test to examine the direction of causality between variables. The results indicate unidirectional causality running from economic growth to financial stability in selected panel of South Asian countries.

These findings lead to some important implications for the future policy of economic and financial integration. Our analysis suggest that economic and financial integrations are the main channels that transmitted the effect of financial crisis in South Asian economies. It implies that more a domestic financial system depends on trade and financial openness, more it might be hit by the financial crisis. This mean that opening up either trade or capital account can results in a negative response during financial crisis periods. No doubt, trade openness and foreign capital flows are important source of growth for developing countries. This consideration arises another important question of how should developing countries response during financial crisis period in order to promote financial and economic integration as well as to main their domestic financial stability. The key suggestion is that to make an efficient intra-regional integration policy instead of depending much on economies of extra-regional developed countries.

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APPENDIX

Table A1 - Cross-sectional Independence Tests

Variables	Pesaran Test			Friedman Test		
	Statistics	P-value	ABS	Statistics	P-value	ABS
$AFSI_{it}$	8.103	0.000	0.466	74.477	0.000	0.466
$FINT_{it}$	7.535	0.000	0.415	85.981	0.000	0.415
$EINT_{it}$	3.072	0.002	0.355	61.942	0.000	0.355
EG_{it}	0.409	0.682	0.206	33.215	0.000	0.206
$GEXP_{it}$	0.716	0.474	0.325	33.784	0.000	0.325

THE EFFECT OF INDUSTRY AND CORPORATE CHARACTERISTICS ON BOND RATING

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Abstract:

The objective of the paper is to analyse the effect of selected quantitative and qualitative variables on corporate bond rating. The primary focus is paid to the application of ordinal logistic regression and estimation of three models that are derived on the basis of macroeconomic, industry and financial variables. The overall results suggest that there are sectors with a higher probability of better rating assessment. Based on the analysis, we can conclude that although there is a significant association between industry sector and bond rating, the most significant predictors of rating are financial indicators of size and profitability of firms. The results of the analysis should be taken into account when the primary interest is to assess unrated companies or to evaluate the impact of financial performance on current rating.

Keywords: bond rating, credit risk, ordinal logistic regression, model estimation, prediction

JEL Classification: G24, G32

1. Introduction

Corporate bond rating can be considered as an assessment of the creditworthiness of bond issues. Two main rating agencies, S&P and Moody's, emphasise that credit ratings are forward looking. It means that in addition to analysing historical information, they also assess the potential impact of foreseeable future events. The mentioned rating agencies have been recently criticized for not sufficient response in terms of not downgrading some securities prior to the financial crisis and this is the main reason why many countries have adopted new regulations on the services of rating agencies. In spite of the recent development, the influence of rating agencies on financial markets is still significant. As a result, it is essential to understand rating, the ways how it is measured and main factors of rating assessment.

The paper aims to analyse the relationships between credit rating and selected quantitative and qualitative factors. The purpose is to estimate the influence of macroeconomic indicators, industry characteristics and accounting variables on corporate bond rating by means of ordinal logistic regression. The structure of the paper is as follows: Firstly, the methodology of logistic regression will be described and the next part will be devoted to the use of the ordinal logistic regression on the data of selected companies. The estimated models will be then presented and interpreted in the next part of the paper. Finally, the overall results and recommendations will be summarized in the conclusion.

2. Importance of credit rating models

Corporate bond rating is essentially associated with the presence of credit risk. As Joseph (2013, 15) states, the credit risk exists whenever a product or service is obtained without paying for it. The report on the credit risk of fixed income securities is provided by credit rating agencies which highlight some key features about their rating provided. The Standard & Poor's consider credit ratings as the opinions about the ability and willingness of an issuer to meet financial obligations in full and on time. Thus, ratings are evidently associated with the credit quality of an individual debt issue and the relative likelihood that the issue may default. Each rating agency uses its own methodology in measuring creditworthiness and uses its own rating scales. Many countries have adopted new regulations on the services of rating agencies in response to recent financial crisis. In addition to national or regional solutions such as European credit rating agency, there is an initiative for the establishment of international non-profit credit rating agency called INCRA[1]. Although the credibility of rating agencies has been deteriorated in the context of financial crisis, they currently put a lot of effort to improve their reliability and improve their position. Nevertheless, as mentioned above, the

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[1] An International Non-Profit Credit Rating Agency (INCRA). Bertelsmann Foundation, available online: http://www.bfna.org/category/publication-type/incra

credit ratings remain important indicators of credit risk and it suggests that credit rating models can be used as a suitable guideline when evaluating unrated firms.

The relationship between credit rating and various variables have been already analysed in variety of economic studies investigating some patterns that could be used to predict potential financial problems of companies. Primarily, these studies have been focused on the prediction of financial distress, or bankruptcy prediction. One of the best known models in this area is applied by E. I. Altman (1968), whose default model is often used as a tool in company financial analysis. The other research in this area is concentrated on bond rating models. In addition to discriminant analysis, regression analysis became one of the most used methods to estimate rating in the primary research. An approach of the multivariate discriminant analysis was introduced by Pinches and Mingo (1973), Ang and Patel (1978), Belkaoui (1980) and Altman and Katz (1976). Subsequent research was concentrated on comparison of particular statistical methods; for example Kaplan and Urwitz (1979) compare ordered probit analysis with ordinary least square regression, Wingler and Watts (1980) compare ordered probit analysis with multiple discriminant analysis. While the previous studies are mostly focused on companies, Cantor and Packer (1996) investigate the relationship between sovereign ratings and macroeconomic factors. Further research of bond rating modelling aims at improving or extending the previous approaches, mainly by considering new variables, or examining the impact of financial variables on credit rating within a given country or region. In addition, Chan and Jegadeesh (2004) suggest a relative rating strength portfolio formed by buying under-rated bonds according to the statistical model. The relationship between innovation indicators and credit ratings in Germany is investigated by Czarnitzki and Kraft (2004), Gray, Mirkovic and Ragunathan (2005) analyse the determinants of credit rating in Australia. Pasiouras, Gaganis and Doumpos (2007) developed a multicriteria decision model to replicate the credit ratings of Fitch on Asian banks. There are also research studies examining the relationship between credit rating and probability of default. For example, Hilscher and Wilson (2011) suggest that although ratings are not sufficient measures of raw default probability, they are strongly related to a systematic default risk.

2. Overview of ordinal logistic regression

The relationship between bond rating and selected variables will be analysed by the means of logistic regression. The essential question is to estimate models which allow predicting a categorical outcome. The simplest case is bivariate logistic regression with dichotomous categorical variable and one independent variable. In this problem, we try to predict the probability that a case will be classified into one of the two categories (Menard 2010, 14). The model is based on the logistic distribution and according to Hosmer, Lemeshow and Sturdivant (2013, 6 - 7), it can be expressed as

$$\pi(x) = \frac{e^{\beta_0 + \beta_{1x}}}{1 + e^{\beta_0 + \beta_{1x}}}, \tag{2.1}$$

where $\pi(x) = E(Y \mid x)$ represents the conditional mean of Y "given" *x* when the logistic distribution is used, Y denotes the outcome variable and *x* denotes a specific value of the independent variable. The equation (2.1) is then modified and $\pi(x)$ is transformed which can be described as

$$g(x) = \ln\left(\frac{\pi(x)}{1 - \pi(x)}\right) = \beta_0 + \beta_{1x}, \tag{2.2}$$

where *g(x)* is called the logit. It is linear in its parameters, continuous and may range from -∞ to+∞. The values of parameters in the equation (2.2) can be estimated by the method of maximum likelihood as the values that maximize the probability of obtaining the observed set of data.

The likelihood function is

$$l(\beta) = \prod_{i=1}^{n} \pi(x_i)^{y_i}\left[1 - \pi(x_i)^{1 - y_i}\right] \tag{2.3}$$

As Hosmer, Lemeshow and Sturdivant suggest (2013, 9), it is easier to mathematically work with the log of equation (2.3) called the log-likelihood,

$$L(\beta) = \ln[l(\beta)] = \sum_{i=1}^{n} \{ y_i \ln[\pi(x_i)] + (1 - y_i) \ln[1 - \pi(x_i)] \}. \tag{2.4}$$

The simplest dichotomous case can be then extended by considering more than one independent variable or by increasing the number of categorical outcome. If this is the case, then the multinomial logistic regression is applied. If the scale of a multiple category is ordinal, it is advised to preferably use the ordinal logistic regression which respects the natural ranking of categorical outcome. Hosmer, Lemeshow and Sturdivant (2013, 289) state that even in these cases the multinomial logistic regression could be used, but it must be realised that not taking into account the natural ordering of outcome variable, estimated models may not address the questions asked of the analysis. Menard (2010, 193) describes ordinal variables as either crude measurement of a variable that could be measured on an interval or ratio scale, or measurement of an abstract characteristic for which there is a no natural metric or unit of measurement.

If we use the ordinal logistic regression, we can choose more regression models, specifically the adjacent-category, the continuation ratio and the proportional odds models. The ordinal logistic model can be briefly described according to Hosmer, Lemeshow and Sturdivant (2013, 290 - 291) as follows: We assume that the ordinal outcome variable, Y, can take on $K + 1$ values coded $0,1,\dots,K$. The probability that the outcome is equal to k conditional on a vector, $\mathbf{x}$, of p covariates is denoted as $\Pr(Y=k \mid \mathbf{x}) = \Phi_k(\mathbf{x})$. When we assume an ordinal model we have to decide what outcomes to compare and what the most reasonable model is for the logit. There are three main following alternatives: Compare each response to the next larger response (adjacent-category logistic model); compare each response to all lower responses (continuation-ratio logistic model); or compare the probability of an equal or smaller response to the probability of a larger response (proportional odds model).

In this paper, the proportional odds model will be used. As Hosmer, Lemeshow and Sturdivant (2013, 292) propose this model is most frequently used ordinal logistic regression model. With the proportional odds model we compare the probability of an equal or smaller response, $Y \leq k$, to the probability of a larger response, $Y > k$,

$$c_k(\mathbf{x}) = \ln\left[\frac{\Pr(Y \leq k | \mathbf{x})}{\Pr(Y > k | \mathbf{x})} \right] = \ln\left[\frac{\Phi_0(\mathbf{x}) + \Phi_1(\mathbf{x}) + \dots + \Phi_k(\mathbf{x})}{\Phi_{k+1}(\mathbf{x}) + \Phi_{k+2}(\mathbf{x}) + \dots + \Phi_K(\mathbf{x})} \right] = \tau_k - \mathbf{x}'\boldsymbol{\beta} \tag{2.5}$$

for $k = 0,1, \dots, K - 1$. In the case when $K = 1$ the model is simplified to the usual logistic regression model in that it yields odds ratios of $Y = 0$ versus $Y = 1$. The method which is used to fit the model is based on an adaptation of the multinomial likelihood for $K = 2$.

The basic procedure involves the following steps (Hosmer, Lemeshow and Sturdivant, 2013, 292):

- The expressions defining the model-specific logits are used to create an equation defining $\Phi_k(\mathbf{x})$ as a function of the unknown parameters.
- The values of a $K + 1$ dimensional multinomial outcome, $\mathbf{z}' = (z_0, z_1, \dots, z_k)$, are created from the ordinal outcome as $z_k = 1$ if $y = k$ and $z_k = 0$ otherwise , where only one value of z is equal to 1.

The likelihood for a sample of n independent observations, $(y_i, \mathbf{x}_i)$, $i = 1, 2,\dots,n$, is:

$$l(\boldsymbol{\beta}) = \prod_{i=1}^{n} \left[\phi_0(\mathbf{x}_i)^{z_{0i}} \phi_1(\mathbf{x}_i)^{z_{1i}} \times \dots \times \phi_K(\mathbf{x}_i)^{z_{Ki}} \right], \tag{2.6}$$

where $\boldsymbol{\beta}$ denotes both the p slope coefficients and the K model-specific intercept coefficients. Then, the log-likelihood function is

$$l(\boldsymbol{\beta}) = \sum_{i=1}^{n} z_{0i} \ln\left[\phi_0(\mathbf{x}_i)^{z_{0i}} \phi_1(\mathbf{x}_i)^{z_{1i}} \times \dots \times \phi_K(\mathbf{x}_i)^{z_{Ki}} \right]. \tag{2.7}$$

When applying the method, it should be checked whether the assumption of proportional odds is supported by the data, or to assess goodness of fit for the model. The tests compare the model (2.5) to an augmented model in which the coefficients for the model covariates are allowed to be different:

$$c_k(\mathbf{x}) = \ln\left[\frac{\Pr(Y \le k|\mathbf{x})}{\Pr(Y > k|\mathbf{x})}\right] = \tau_k - \mathbf{x}'\boldsymbol{\beta}_k, \qquad (2.8)$$

where $\tau_k < \tau_{k+1}$ for $k = 1,\dots, K$. Norušis (2012, 70) highlights that before the coefficients for the predictor variables, there is a minus sign which is done so that larger coefficients indicate an association with larger scores. For a continuous variable, positive coefficients suggest as the values of the variable increase, the likelihood of larger score increases. Each logit has its own τ_k term but the same coefficient which means that the effect of the independent variable is the same for different logit functions. As Hosmer, Lemeshow and Sturdivant recommend (2013, 276), we should use the likelihood ratio test to assess the significance of the variable in the model. We compare the log-likelihood from the model containing variables (L_1) to the model containing only constant terms (L_0). Under the null hypothesis that the coefficients are zero, the value of statistic (2.9) follows the chi-square distribution with p degrees of freedom,

$$G = -2 \times \left[-L_0 - (L_1)\right]. \qquad (2.9)$$

The τ_k terms in (2.9) are called threshold values and they are used in the calculations of predicted values, see Norušis (2012, 71 - 72).

3. Description of data sample

The empirical analysis is carried out using the corporate data on 298 industrial companies comprising European, Russian, Canadian and U.S. corporate bonds[2], where the former companies represent 56% data of the whole sample. Among the European companies, there are firms from Central and Eastern Europe included. However, as the rating is not assigned in those countries widely, they create a minority (2%). The sample consists of companies which issued corporate bonds and the bonds were assigned credit rating by Moody's rating agency as to the end of 2010. For the purposes of analysis, only bonds with rating higher than Caa are considered. As there is no bond in the Aaa category, the bonds fall within six rating categories coded as 0 (Caa), 1 (B), 2 (Ba), 3 (Baa), 4 (A) and 5 (Aa). The overall sample was split into two sub-samples: The experimental sample used in the analysis and the control sample used in the validation. Absolute numbers and relative percentages of observations according to their rating are summarized in the table below (Table 1).

Table 1 - Representation of rating categories in the sample

Rating category	Number of observations			Relative percentage (%)		
	All	Exp	Control	All	Exp	Control
Aa	8	6	2	2.7	2.3	4.1
A	57	44	13	19.1	17.7	26.5
Baa	106	94	12	35.6	37.8	24.5
Ba	65	50	15	21.8	20.1	30.6
B	51	44	7	17.1	17.7	14.3
Caa	11	11	0	3.7	4.4	0
Total	298	249	49	100	100	100

The data sample covers bonds of companies from different industrial sectors. The industry groups have been created according to the Thomson Reuters Business Classification[3] and there are

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[2] Austria, Belgium, Canada, Czech Rep., Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Russia, Slovenia, Spain, Sweden, Switzerland, United States, United Kingdom

[3] http://thomsonreuters.com/business-classification/

seven economic sectors included in the sample. The sectors are coded as follows: 1 (consumer cyclicals), 2 (energy), 3 (industrials), 4 (basic materials), 5 (consumer non-cyclicals), 6 (technology), 7 (telecommunications services). To examine whether there is a relationship between industry sector and rating assignment, the sector will be considered as an independent variable in the ordinal logistic regression. Other variables in the analysis are quantitative and can be grouped into the following categories: Macroeconomic, market and accounting indicators. The input data covered almost forty variables in the initial phase of the analysis. To reduce the number of covariates in the logistic regression, firstly the correlation analysis was used to find the strongest simple relationships between rating and each selected variable. Then, the univariable analysis of each independent variable was carried out. For a first model, any variable whose univariable test has a p - value less than 0.25 was identified (Table 2). This approach is suggested for example by Hosmer, Lemeshow and Sturdivant (2013, 91). The univariable analysis showed a relatively strong relationship between rating and macroeconomic variables from the period 2008, which is associated with the beginning of the financial crisis.

Table 2 - Input variables and *p*-values of univariable tests

Variable	*p* - value	Variable	*p* - value
EPS	0.0081	Current ratio	0.3973
Equity/Total assets	0.1511	Acid ratio	0.4497
Total debt/Total assets	0.1780	Days total assets outstanding	0.0369
Long term debt/Total assets	0.2764	Days inventory outstanding	0.0001
Total debt/Equity	0.6225	Profit margin	0.0422
Interest coverage	0.0249	Sales/Total assets	0.0023
Return on assets	0.0000	Receivables turnover	0.3010
Return on equity	0.0000	Inventory turnover	0.0278
Return on capital employed	0.0000	Logarithm of total assets	0.0000
Return on sales	0.0000		

Eventually, eleven continuous and one categorical variable (Table 3) have been selected for the multivariable analysis which is described in the following chapter.

Table 3 - Independent covariates

Variable	Label	Group
GDP growth (2008)	GDP_2008	Macroeconomic
GDP growth (2010)	GDP_2010	
Long term interest rates (2008)	LTIR_2008	
Long term interest rates (2010)	LTIR_2010	
Sector	SECTOR	Industry
Earnings per share	EPS	Market
Days of inventory outstanding	DAYSINV	Accounting

Interest coverage	INTCOV
Logarithm of total assets	LOGTA
Profit margin	MARGIN
Return on assets	ROA
Return on equity	ROE

4. Analysis of rating and industry sector

Firstly, the ordered logistic regression is used on rating and sector, ignoring all the remaining variables. The overall model test is examined on the base of -2 log-likelihood (2.9). In our case, G is 29.04 and it has an observed significant level of 0.0377 (df = 6). Thus we can reject the hypothesis that the model without predictors is as good as the model with predictors and we suggest that sector is significantly associated with bond rating. The cumulative estimated probabilities of adjacent rating categories are shown in the following table (Table 4). Based on the model, the middle rating Baa is assigned to companies with the highest probability. However, there are significant differences in the probabilities of other rating categories. For example, the rating A is predicted with the probability of 0.37 for industrials and with the probability of 0.33 for non-cyclicals, while firms from energy and telecommunication industry are assigned rating Ba with the probability of around 0.24. The rating Aa is predicted with the highest probability of 0.08 to industrials and the lowest rating would be assigned with the probability of 0.06 to energy sector.

Table 4 - Cumulative probabilities of rating prediction

Industry sector	Caa	Caa, B	Caa, B, Ba	Caa, B, Ba, Baa	Caa, B, Ba, Baa, A	Caa, B, Ba, Baa, A, Aa
consumer cyclicals	0.0464	0.2413	0.4671	0.8461	0.9815	1
energy	0.0588	0.2900	0.5296	0.8760	0.9856	1
industrials	0.0106	0.0653	0.1614	0.5470	0.9211	1
basic materials	0.0227	0.1317	0.2948	0.7240	0.9620	1
consumer non-cyc	0.0137	0.0834	0.2006	0.6115	0.9383	1
technology	0.0217	0.1265	0.2853	0.7147	0.9603	1
telecommunication	0.0537	0.2706	0.5056	0.8652	0.9841	1

The Figure 2 shows predictions of rating for each of the industry sectors under consideration. As can be seen, the lowest rating categories are estimated for energy, telecommunication and consumer cyclicals industries. Two extreme sectors in terms of rating predictions are energy and industrials. Bonds from energy sector are predicted lower rating than bonds from industrials, which tend to get middle and upper rating assignment.
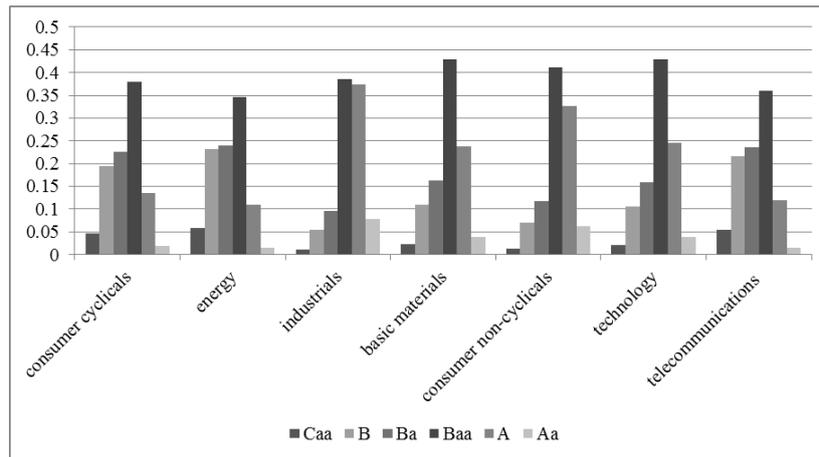
Figure 2 - Prediction of rating within industry sectors

The Wald tests of sector estimated parameters suggest that some sectors can be pooled together and we get alternative four groups of bonds according to their sectors: consumer cyclicals, industrials, energy, basic materials, consumer non-cyclicals, technology, and telecommunication services. Groups, the original and modified will be used in the analysis below.

5. Estimation of bond rating models

In the second phase of the analysis, all the input variables as described in Chapter 2 (Table 1) are considered in the analysis. Results of fitting the models are presented in the Appendix.

The first model (MODEL 1) includes seven sectors and eleven financial predictors. The approximate likelihood ratio of the first model (Appendix, Table A) is G = 228.0971 with $p = 0.0000$. Based on the results, it can be suggested that LTIR_2008, LTIR_2010, LOGTA, ROA, MARGIN and SECTOR are strongly related to bond rating. As mentioned in the Chapter 2, the ordered logit model estimates one equation over all levels of the dependent variable. The estimated cut points are included in the table as constants. The second column (Coef.) represents the ordered log-odds regression coefficients. The association between variables and rating can be interpreted by a measure called odds ratio in the last column. For example, for a one unit increase in LOGTA, the odds of higher rating versus the combined lower ratings are 38.27 times greater, given the other variables are held constant in the model[4]. Thus we can conclude that the probability of higher rating is strongly positive to the value of LOGTA. A similar relationship is evident for all the variables with odds-ratio greater than 1. Overall, the probability of higher rating is positively associated with LTIR_2008, GDP_2008, GDP_2010, EPS, ROE, DAYSINV, LOGTA, and ROA. On the contrary, the negative relationship is observed for LTIR_2010, INTCOV and MARGIN. The overall results suggest that most of the variables included in the analysis are positively associated with rating. However, there is not clear relationship between long term interest rates and rating; the possible cause could be the persistent consequence of the financial crisis. The odds value for INTCOV is nearly 1 which suggests rather positive association to rating. Eventually, a negative association is detected between rating and profit margin which means that companies with higher profit margins tend to get lower rating assignment.

As suggested in the Chapter 3, four sector groups will be used in the analysis to examine if some sectors can be pooled without any negative impact on rating prediction. The second model (MODEL 2) includes four sectors and eleven financial predictors. The approximate likelihood ratio of the model (Appendix, Table B) is G = 218.9386 with p = 0.000. In this model, variables LTIR_2008, LTIR_2010, LOGTA, ROA and MARGIN are statistically significant at the level of significance of 0.05. According to the odds ratio, the probability of higher rating is positively associated with LTIR_2008, GDP_2010, EPS, ROE, DAYSINV, LOGTA, and ROA. On the contrary, the negative relationship is observed for LTIR_2010, GDP_2008, INTCOV and MARGIN. The relationship between rating and most of the variables is confirmed when compared with the previous model

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[4] Introduction to SAS. UCLA: Statistical Consulting Group. http://www.ats.ucla.edu/stat/sas/notes2/ (accessed November 24, 2014).

however the effect of macroeconomic variables is ambiguous. Based on *p*-values, this model suggests that there is positive relationship between rating and GDP_2008 while a negative association of rating and GDP_2010.

Finally, the model (MODEL 3) ignoring industry sectors was estimated (Appendix, Table C). The likelihood ratio of this model is G = 217.0149 with *p* = 0.0000. Variables LTIR_2008, LTIR_2010, LOGTA, ROA and MARGIN are statistically significant at .05 level of significance, GDP_2010 and DAYSINV are significant at a higher level of .10. The direction of the association between rating and each variable is the same as in the previous model, namely the negative relationship between profit margin and rating is confirmed.

The estimated models were used for bond rating prediction to assess their prediction ability. The first model (MODEL 1) correctly classified 59.3 % of cases of the analytical sample in total; however there are differences among individual rating categories. The model predicts more bonds as Ba and B when compared to the observed data. When the model was used on the control sample comprising 38 bonds not included in the analysis, it correctly classified 63.2% of cases. Next, the model with four sectors (MODEL 2) was used to classify bonds into rating categories. The model correctly classified 60.3% cases of the analytical sample, and 63.2% of the control sample. The classification ability of both models is comparable. The final model without sectors (MODEL 3), correctly classified 58.8% cases in the analytical sample and 66.7% cases in the control sample. To summarize, the classification ability of models is similar, there are only small differences. As the greatest hit ratio was achieved with the last model ignoring the industry sector, this model can be assumed as the most suitable prediction model. This model contains eleven quantitative variables including four macroeconomic indicators.

Conclusion

The paper was devoted to the empirical analysis of the effect of selected qualitative and quantitative variables on credit bond rating. The most significant variables were identified and used for the model estimations based on the empirical data of corporate bonds as to the end of 2010. The models were derived by the ordinal logistic regression and three proportional-odds models were estimated. Special attention was paid to the relationship between rating assessment and industry sector. It was proved that the industry sector is significantly associated with bond rating. The results of the analysis suggest that companies from the sectors of industrials and non-cyclicals have the higher probability of better rating assessment when compared to other sectors.

Next, all the input variables, both quantitative and qualitative, were used in the multivariable analysis. Three models were estimated according to the input variables. The overall results show that there are three financial indicators with the significant effect on bond rating: the size of the company measured by logarithm of total assets, return on assets and profit margin. The probability of better rating assessment is strongly positive to the value of company assets, the same holds for the return on equity. On the contrary, the negative relationship was observed for the profit margin. The findings of the analysis suggest that companies with higher profit margins are considered as more risky, their performance can deteriorate during bad times and they are assigned lower rating grades. Based on the analysis, macroeconomic indicators were not identified as suitable predictors of rating, although there is a significant relationship between rating and long-term interest rates. The predictive ability of all three models is similar; however the model with the quantitative variables only has the highest hit ratio. The results of the analysis should be taken into account when the primary interest is to assess unrated companies or to evaluate the impact of financial performance on current rating. Thus, the practical use of models lies in the area of management decision process and managing credit risk.

Acknowledgement

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APPENDIX

Table A - Results of fitting the proportional odds model (MODEL 1)

Variable	Coef.	Std. Err.	z	p	95% CI		Odds Ratio
LTIR_2008	1.1868	0.5252	2.26	0.024	0.1574	2.2161	3.2765
LTIR_2010	-0.8892	0.3272	-2.72	0.007	-1.5305	-0.2479	0.411
GDP_2008	0.0046	0.1684	0.03	0.978	-0.3254	0.3346	1.0047
GDP_2010	0.1582	0.1484	1.07	0.287	-0.1327	0.449	1.1713
EPS	0.0173	0.0173	1	0.316	-0.0165	0.0512	1.0175
INTCOV	-0.0011	0.0024	-0.46	0.644	-0.0058	0.0036	0.9989
ROE	0.3539	0.6779	0.52	0.602	-0.9748	1.6826	1.4246
DAYSINV	0.0053	0.0033	1.59	0.112	-0.0012	0.0118	1.0053
LOGTA	3.6446	0.358	10.18	0	2.9429	4.3463	38.2664
ROA	13.8881	3.4918	3.98	0	7.0444	20.7318	1075287
MARGIN	-0.1257	0.0475	-2.65	0.008	-0.2187	-0.0327	0.8819
SECTOR							
2	2.2113	0.8052	2.75	0.006	0.6331	3.7895	9.1279
3	2.6302	0.8914	2.95	0.003	0.883	4.3773	13.8763
4	1.9429	0.8299	2.34	0.019	0.3164	3.5694	6.9791
5	2.2987	0.8529	2.7	0.007	0.627	3.9704	9.9617
6	1.1695	2.3224	0.5	0.615	-3.3824	5.7213	3.2203
7	1.545	0.8694	1.78	0.076	-0.159	3.249	4.6879
Constant 1	35.3976	4.019			27.5205	43.2746	35.3976
Constant 2	38.9644	4.1532			30.8242	47.1046	38.9644
Constant 3	41.3563	4.2759			32.9757	49.737	41.3563
Constant 4	44.7473	4.4626			36.0009	53.4938	44.7473
Constant 5	47.7861	4.6228			38.7256	56.8466	47.7861

Log-likelihood = -191.1055

Table B - Results of fitting the proportional odds model (MODEL 2)

Variable	Coef.	Std. Err.	z	p	95% CI		Odds Ratio
LTIR_2008	1.0524	0.4644	2.27	0.023	0.1422	1.9625	2.8644
LTIR_2010	-0.75	0.3077	-2.44	0.015	-1.3531	-0.1469	0.4724
GDP_2008	-0.0752	0.1559	-0.48	0.629	-0.3809	0.2304	0.9275
GDP_2010	0.2328	0.1438	1.62	0.105	-0.049	0.5146	1.2621
EPS	0.0203	0.0171	1.19	0.234	-0.0131	0.0538	1.0205
INTCOV	-0.001	0.0019	-0.5	0.617	-0.0048	0.0028	0.999
ROE	0.4537	0.7466	0.61	0.543	-1.0096	1.9169	1.5741
DAYSINV	0.0043	0.0031	1.38	0.168	-0.0018	0.0105	1.0043
LOGTA	3.5722	0.3487	10.24	0	2.8888	4.2557	35.5965
ROA	12.2818	3.3431	3.67	0	5.7294	18.8341	215726
MARGIN	-0.1196	0.0458	-2.61	0.009	-0.2093	-0.0298	0.8873
SECTOR							
2	0.3726	0.4964	0.75	0.453	-0.6004	1.3456	1.4515
3	0.5075	0.6036	0.84	0.4	-0.6754	1.6905	1.6612
4	-0.2348	0.6401	-0.37	0.714	-1.4892	1.0197	0.7908

Variable	Coef.	Std. Err.	z	p	95% CI		Odds Ratio
Constant 1	33.0321	3.6627			25.8534	40.2108	33.0321
Constant 2	36.5273	3.7948			29.0897	43.9648	36.5273
Constant 3	38.9074	3.9312			31.2023	46.6125	38.9074
Constant 4	42.1213	4.096			34.0933	50.1494	42.1213
Constant 5	45.0826	4.2665			36.7205	53.4448	45.0826

Log-likelihood = - 195.6848

Table C - Results of fitting the proportional odds model (MODEL 3)

Variable	Coef.	Std. Err.	z	p	95% Conf.		Odds Ratio
LTIR_2008	0.8648	0.4085	2.12	0.034	0.0641	1.6655	2.3745
LTIR_2010	-0.7044	0.2965	-2.38	0.018	-1.2855	-0.1233	0.4944
GDP_2008	-0.0645	0.1559	-0.41	0.679	-0.37	0.2411	0.9376
GDP_2010	0.2315	0.1423	1.63	0.104	-0.0475	0.5104	1.2605
EPS	0.0179	0.017	1.05	0.292	-0.0154	0.0513	1.0181
INTCOV	-0.0011	0.002	-0.56	0.573	-0.0049	0.0027	0.9989
ROE	0.2726	0.5657	0.48	0.63	-0.836	1.3813	1.3134
DAYSINV	0.0051	0.003	1.67	0.095	-0.0009	0.011	1.0051
LOGTA	3.5602	0.3455	10.31	0	2.8831	4.2372	35.1685
ROA	13.1562	3.1437	4.18	0	6.9947	19.3177	517202
MARGIN	-0.1255	0.0451	-2.78	0.005	-0.2139	-0.0371	0.882
Constant 1	32.1137	3.4482			25.3554	38.8721	32.1137
Constant 2	35.5879	3.5787			28.5738	42.602	35.5879
Constant 3	37.9707	3.726			30.6679	45.2734	37.9707
Constant 4	41.1566	3.8955			33.5215	48.7917	41.1566
Constant 5	44.0834	4.056			36.1337	52.0331	44.0834

Log-likelihood = -96.6467

ESTIMATION OF BANKING EFFICIENCY DETERMINANTS IN THE CZECH REPUBLIC

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Abstract:

The aim of this paper is to estimate the banking efficiency determinants of the Czech commercial banks during the period 2001-2013. For estimation of banking efficiency we applied the Data Envelopment Analysis on data of the Czech commercial banks. We simultaneously use two alternative specifications of Data Envelopment Analysis approach, specifically CCR model and BCC model that differ in returns to scale assumption. The determinants of banking efficiency were estimated using the panel data analysis. The results of the paper show that the level of capitalization, credit risk, liquidity risk and riskiness of portfolio had a positive impact on banking efficiency. Gross domestic product per capita had a negative impact on banking efficiency. We found that in BCC model, the liquidity risk and riskiness of portfolio had a positive impact on efficiency in the Czech banking sector. Other determinants were not statistical significant in this model. Banks with a higher ratio of loans to deposit, ratio of loans to assets, higher ratio of equity to total assets were more efficient than other commercial banks in the Czech banking sector. The impact of the ownership structure was not statistical significant during the analyzed period.

Keywords: bank specific factors, Czech banking sector, Data Envelopment Analysis, efficiency, market specific factors.

JEL Classification: G21, C58

1. Introduction

The Czech financial system can be characterized as a bank-based system and banks play an important role in the economy. The transformation and consolidation of the Czech banking sector was carried out during the 1990s. From 1998–2001, a second round of privatization occurred with the sale to foreigners of majority equity interests in four large Czech banks: Československá obchodní banka (ČSOB), Česká spořitelna (ČS), Komerční banka (KB) and Investiční a poštovní banka (IPB). ČSOB, ČS and KB are still the dominant players in the market.

The aim of the paper is to estimate the banking efficiency determinants of the Czech commercial banks over the period 2001-2013. First, we estimated the efficiency of the Czech banking sector. We employed the non-parametric approach, especially the Data Envelopment Analysis (DEA) on the data of the Czech commercial banks. We simultaneously use two alternative specifications of DEA approach, specifically CCR model and BCC model that differ in returns to scale assumption. Next, we examined the determinants of the banking efficiency in the Czech banking industry.

The structure of the paper is following. Next chapter presents empirical literature. Third section describes methodology, especially DEA approach. Next Section presents data and selection of variables and fifth section shows empirical analysis and results. Last section concludes this paper.

2. Literature review

Empirical studies on the determinants of banking efficiency consider bank specific factors and macroeconomics factors. Stavárek (2005) estimated determinants of banking efficiency in Visegrad countries during the period 1999-2003. He found that bank-specific factors were significant and macroeconomics factor were not significant besides GDP. Košak and Zajc (2006) estimated determinants of efficiency in the new EU member countries. They found a negative relationship of the intermediation ratio and density of demand. The deposit per capita and population were positively associated with cost efficiency. ROA and ROE were positively related to efficiency.

As showed Akin *et al.* (2009) and Vu and Nahm (2013), bank-specific characteristics include bank size, equity over total assets, return on assets or equity, loans-to-total assets, type of ownership, bank configuration. Empirical literature review showed that there is no common consensus exists about effects of banking efficiency determinants.

Bank size is generally measured by banks' amount of assets. E.g. Grigorian and Manole

(2002), Mercan *et al.* (2003), Williams and Nguyen (2005), Rezitis (2007) or Vu and Nahm (2013) found a positive relationship between bank size and banking efficiency. On the other hand, Isık and Hassan (2002), Chen *et al.* (2005) or Akin *et al.* (2009) discovered a negative effect of bank size on banking efficiency. Grigorian and Manole (2002), Altunbas *et al.* (2007), Chortareas *et al.* (2009) and Vu and Nahm (2013) found a positive relationship between the level of capitalisation and banking efficiency. In contrast, Pasiouras *et al.* (2007) and Cavallo and Rossi (2002) found that the level of capitalisation had a negative impact on efficiency. Ariff and Can (2009) and Sanchez *et al.* (2013) found that banks with higher ROE were more efficient.

As Vu and Nahm (2013) showed, some studies consider the influences of various types of risk, such as liquidity risk, credit risk and management risk. Berger and Mester (1997) found that banks with a higher ratio of loans to total assets (proxy for credit risk) were more profit efficient than other banks in the US banking sector. Yildirim and Philippatos (2007) also found a positive relationship between the ratio of loans to total asset and efficiency. In contrast, Brissimis *et al.* (2008) and Havrylchyk (2006) found a negative relationship between the credit risk and efficiency. Brissimis *et al.* (2008) found a negative relationship between the liquidity risk and bank efficiency. Ariff and Can (2008) found that it had a positive impact on efficiency.

Gross domestic product (GDP) was used as a market specific factor in empirical studies. Maudos *et al.* (2002), Hasan *et al.* (2009) and Vu and Nahm (2013) showed the positive relationship between GDP and banking efficiency. Perera *et al.* (2007) considered other factors as well and found that banking markets with high levels of market concentration, monetisation, interest rates and GDP growth rate tend to achieve higher efficiency in South Asian. In contrast, Thoraneenitiyan and Avkiran (2009) found that the overall level of economic development (GDP) had a negative effect on bank efficiency in East Asian countries. Furthermore, Brissimis *et al.* (2008) examined a positive relationship between profit efficiency and short-term interest rates. Also Vu and Nahm (2013) found that a low-inflation rate provide a favourable environment for banks to improve their profitability.

3. The theoretical framework

The study of the efficient frontier began with Farrell (1957), who defined a simple measure of a firm's efficiency that could account for multiples inputs. The Data Envelopment Analysis is a mathematical programming technique that measures the efficiency of a decision-making unit (DMU) relative to other similar DMUs with the simple restriction that all DMUs lie on or below the efficiency frontier (Seiford and Thrall, 1990). DEA calculates the relative efficiency of each DMU in relation to all the other DMUs by using the actual observed values for the inputs and outputs of each DMU. It also identifies, for inefficient DMUs, the sources and level of inefficiency for each of the inputs and outputs (Charnes *et al.*, 1995). The term DEA was first introduced by Charnes *et al.* (1978) based on the research of Farrell (1957). CCR model is the basic DEA model as introduced by Charnes *et al.* (1978). This model was modified by Banker *et al.* (1984) and became the BCC model which accommodates variable returns to scale. The CCR model presupposes that there is no significant relationship between the scale of operations and efficiency by assuming constant returns to scale (CRS) and it delivers the overall technical efficiency. The constant returns to scale assumption is only justifiable when all DMUs are operating at an optimal scale. However, firms or DMUs in practice might face either economies or diseconomies to scale. Thus, if one makes the CRS assumption when not all DMUs are operating at the optimal scale, the computed measures of technical efficiency will be contaminated with scale efficiencies. Banker *et al.* (1984) extended the CCR model by relaxing the CRS assumption. The resulting BCC model was used to assess the efficiency of DMUs characterized by variable returns to scale (VRS).

This methodology allows handling different types of input and output together. A DEA model can be constructed either to minimize inputs or to maximize outputs. An input orientation objects at reducing the input amounts as much as possible while keeping at least the present output levels, while an output orientation aims at maximizing output levels without increasing the use of inputs.

DEA begins with a fractional programming formulation. Assume that there are *n* DMUs to be evaluated. Each consumes different amounts of *i* inputs and produces *r* different outputs, i.e. DMUj consumes x_{ji} amounts of input to produce y_{ji} amounts of output. It is assumed that these inputs, x_{ji}, and outputs, y_{ji}, are non-negative, and each DMU has at least one positive input and output value. The productivity of DMU can be written as:

$$h_j = \frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}}. \tag{3.1}$$

In this equation, u and v are the weights assigned to each input and output. By using mathematical programming techniques, DEA optimally assigns the weights subject to the following constraints. The weights for each DMU are assigned subject to the constraint that no other DMU has efficiency greater than 1 if it uses the same weights, implying that efficient DMUs will have a ratio value of 1. The objective function of DMU$_k$ is the ratio of the total weighted output divided by the total weighted input:

$$\max h_0(u, v) = \frac{\sum_{r=1}^{s} u_r y_{r0}}{\sum_{i=1}^{m} v_i x_{i0}}, \tag{3.2}$$

subject to:

$$\frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}} \leq 1, j = 1, 2 \ldots, j_0, \ldots, n, \tag{3.3}$$

$$u_r \geq 0, r = 1, 2, \ldots, s, \tag{3.4}$$

$$v_i \geq 0, i = 1, 2, \ldots, m, \tag{3.5}$$

where h_0 *is the technical efficiency of* DMU_0 *to be estimated,* u_r *and* v_i *are weights to be optimized,* y_{rj} *is observed amount of output of the* r^{th} *type for the* j^{th} *DMU,* x_{ij} *is the observed amount of input of the* i^{th} *type for the* j^{th} *DMU,* r *indicates the* s *different outputs,* i *denotes the* m *different inputs, and* j *indicates the* n *different DMU$_s$.*

4. Data and selection of variables

The data set used in this paper was obtained from the database BankScope and the annual reports of commercial banks during the period 2001–2013. All the data is reported on an unconsolidated basis. We analyze only commercial banks that are operating as independent legal entities. We use unbalanced panel data from 14 Czech commercial banks (with regard to mergers and acquisitions of banks). Due to some missing observations we have an unbalanced panel of 161 bank-year observations.

In order to conduct a DEA estimation, inputs and outputs need to be defined. Four main approaches (intermediation, production, asset and profit approach) have been developed to define the input-output relationship in financial institution behavior. We adopted an intermediation approach and consistent with this approach, we assume that banks collect deposits to transform them, using labor, in loans. We employed two inputs (labor and deposits), and two outputs (loans and net interest income). We measure labor by the total personnel costs covering wages and all associated expenses and deposits by the sum of demand and time deposits from customers, interbank deposits and sources obtained by bonds issued. Loans are measured by the net value of loans to customers and other financial institutions and net interest income (NII) as the difference between interest incomes and interest expenses. Descriptive statistics of inputs and outputs is illustrated in Table 1.

Table 1 – Descriptive statistics

Variable	LOANS	NII	DEPOSITS	LABOR
Mean	98566.51	5644.52	150873.91	2027.72
Median	35094.75	1473.80	52158.40	726.40
Max	472886.00	29460.00	636662.00	8525.00
Min	185.30	32.90	351.20	20.00
St.Dev.	119592.31	7322.66	184251.35	2463.58

Source: Author's calculation

We selected several bank and market specific factors which can influenced the efficiency of the Czech banking sector. We included the market share, level of capitalization, ROA, credit risk and liquidity risk, interest rate, riskiness of the bank's overall portfolio, number of branches of individual bank, market concentration, bank ownership structure and GDP. The market share is a percent of total assets of individual banks to total assets of the Czech banking sector. The level of capitalization is the ratio of equity to total assets. ROA is return on assets ratio and it is proxy for the profitability of the banking sector. ROA is determined as total profit (loss) after tax to total assets. The ratio of total loans to total assets was used as a proxy for credit risk. Liquidity risk is represented by the ratio of total loans to total deposits. Interest rate is measure as a ratio of interest income to total loans. Riskiness of the bank's overall portfolio is computed as a ratio of loans loss provision to total assets. Branches of individual banks is number of total branches of each bank. For measure the market concentration is used the Herfindahl-Hirschman index. GDP presents the gross domestic product that is an aggregate measure of production equal to the sum of the gross values added of all resident institutional units engaged in production per capita in each year. Bank ownership structure is proxy by the market share of foreign-owned banks (% of total assets). Descriptive statistics of variables is presented in Table 2.

Table 2 – Descriptive statistics

Variable	CCR	BCC	MS	CAP	ROA	CR	LR	IR	RISKASS	BR	HHI	OWNST	GDP
Mean	0.76	0.92	0.06	0.12	0.03	0.52	0.70	0.10	0.01	146	1040	91.06	321385
Median	0.80	1.00	0.02	0.09	0.01	0.52	0.72	0.08	0.00	45	1066	94.20	326553
Max	1.00	1.00	0.21	0.61	1.18	0.88	1.37	0.81	0.14	684	1137	97.10	388771
Min	0.21	0.23	0.00	0.03	-0.06	0.05	0.05	0.03	0.00	1	947	82.00	239487
St.Dev.	0.22	0.14	0.07	0.10	0.13	0.19	0.26	0.09	0.02	195	66	5.15	48981

Source: Author's calculation

5. Empirical analysis and results

DEA can be used to estimate efficiency under the assumptions of constant and variable returns to scale. For empirical analysis we used MaxDEA software. The results of the DEA efficiency scores based on constant return to scale (CCR model) and variable returns to scale (BCR model) for each year are presented in Table 2.

Table 3 – Average efficiency of the Czech banking sector in CCR and BCC models

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
CCR	70.95	72.63	69.11	78.85	77.04	78.49	73.48	75.65	60.75	71.72	85.89	90.11	91.67
BCC	87.33	92.91	87.99	91.23	91.86	94.06	94.58	96.16	92.05	84.55	96.90	96.17	97.87

Source: Author's calculation

Table 3 presents the results the average score of efficiency using the CCR model and the BCR model in the period 2001–2013. The development of average efficiency was almost constant in the period 2001–2013. During the period 2001–2013, the average efficiency computed using the constant returns to scale (CCR model) ranges from 61 to 92% and the average efficiency computed using the variable returns to scale (BCR model) ranges from 85 to 98%. It shows that the Czech banks are in average considered to be highly efficient with only marginal changes over time. The development trend of the efficiency is similar in both models. We can see that average efficiency was increased during the period 2001 to 2008. In 2009 the average efficiency decreased, which was as a result of the financial crisis. And then the average efficiency increased in the period 2010-2013.

Table 4 – Average efficiency of the Czech commercial banks in CCR and BCC models

DMU	CCR	BCC
Československá obchodní banka	49.65	76.68
Česká spořitelna	69.00	99.02
Komerční banka	59.42	88.88
UniCredit bank	89.68	100.00
Živnostenská banka	75.95	79.87
GE Money Bank	80.83	84.51
Raiffeisenbank	86.18	95.29
Equabank	90.61	100.00
JT Banka	83.14	86.90
LBBW	93.08	97.39
PPF banka	61.15	86.61
Sberbank	97.79	100.00
Citi Bank	59.33	100.00
eBanka	58.47	100.00

Source: Author's calculation

Table 4 presents average efficiency of the Czech commercial banks. In CCR model the most efficient bank was Sberbank and the low efficient bank was Československá obchodní banka, which is one of the group of largest bank in the Czech banking sector. In BCC model the most efficient banks were UniCredit bank, Equabank, Sberbank, Citi Bank and eBanka. These banks reached the 100% efficiency in model with variable return to scale. On the other hand, the lowest efficient bank was also Československá obchodní banka. Efficiency scores of almost all large banks improve when the assumption of variable returns of scale built in BCC model is used. The results of the CCR model and the BCC model show that the model with VRS achieves higher degree of the efficiency than the model with the CRS. Number of efficient banks is higher in the model with VRS. The BCC model decomposes efficiency of production units into two components: the pure technical inefficiency and the efficiency to scale. The values of efficiency computed by the BCC model reach higher values than efficiency computed by the CCR model by eliminating the part of the inefficiency that is caused by a lack of size of production units.

For estimation of the determinants of banking efficiency we used the analysis of panel data:

$$\ln EF_{it} = \ln BS_{it} + \ln CAP_{it} + \ln ROA_{it} + \ln CR_{it} + \ln LR_{it} + \ln IR_{it} + \ln RISKASS_{it} \\ + \ln BR_{it} + \ln HHI_{it} + \ln GDP_{it}, \qquad (4.1)$$

where EF is banking efficiency, *MS* is market share, *CAP* is the level of capitalization, *ROA* is return on assets, *CR* is credit risk, *LR* is liquidity risk, *IR* is interest rate, *RISKASS* is riskiness of the bank's overall portfolio, *BR* is the number of bank's branches, *HHI* is market concentration, *OWNST* is bank ownership structure, *GDP* is gross domestic product per capita and *i* denotes the bank ($i = 1, …, N$), *t* denotes time ($t = 1, …, T$).

Before estimating the model we tested the time series for the stationarity. We applied Levin, Lin and Chu test to test the individual variables for the existence of the unit roots. Test indicates that the variables are stationary on the values so that the null hypothesis of a unit root can be rejected for any of the series. All times series are stationary and can be used in panel regression analysis. The method applied to estimate of equation (4.1) is Ordinary Least Squares (OLS). For correction of

heteroscedasticity is used White (1980) test and heteroscedasticity was rejected. For detecting multicollinearity we used correlation coefficient. From the correlation matrix it is obvious that any variables are not correlated together. To allow for heterogeneity across the banks, we use an error-component model, with the bank and market-specific error components estimated as fixed effects. The regression results of equation (4.1) are presented in Table 5 and Table 6. To conserve the space only final estimations are presented.

Table 5 - Determinants of banking efficiency in CCR model in the Czech banking sector

Variable	Coefficient	t-Statistic
C	0.430406	1.599517
ln*CAP*	0.583593[a]	2.903756
ln*CR*	0.390362[b]	2.262816
ln*GDP*	-0.00000164[a]	-3.812301
ln*HHI*	0.000358[c]	1.707188
ln*IR*	0.306055[b]	2.260650
ln*LR*	0.360537[a]	3.088460
ln*MS*	-3.519028[b]	-2.293856
ln*RISKASS*	1.267241[b]	2.420078
ln*ROA*	0.179987[c]	1.917453

Source: Author's calculation

Note: [a, b, c] denote significance at 1%, 5% and 10% level; Adjujsted R^2 = 0.6572, Prob(F-stat.) = 0.0000, DW = 1.97

Table 5 presents the determinants of banking efficiency in models with constant return to scale in the Czech banking sector during the period 2001-2013. The results show that the level of capitalization, credit risk, concentration, interest rate, liquidity risk, return on assets and riskiness of portfolio had a positive impact on efficiency measured in assumption of constant return to scale. On the other hand, market share and GDP had a negative impact on banking efficiency in the Czech banking sector. Other determinants, i.e. number of branches and ownership structure, were not statistical significant in this model.

Table 6 - Determinants of banking efficiency in BCC model in the Czech banking sector

Variable	Coefficient	t-Statistic
C	0.829647[a]	12.45629
ln*BR*	-0.000597[c]	-1.682276
ln*CAP*	0.331390[b]	2.002640
ln*CR*	0.357846[b]	2.533208
ln*GDP*	-0.0000554[b]	-2.028676
ln*LR*	0.172284[c]	1.715548
ln*RISKASS*	0.841349[c]	1.913032
Adjujsted R^2 = 0.4958, Prob(F-stat.) = 0.0000, DW = 1.92		

Note: [a, b, c] denote significance at 1%, 5% and 10% level
Source: Author's calculation

Table 6 presents the results of determinants of banking efficiency in models with variable return to scale in the Czech banking sector during the period 2001-2013. We found that only number of branches, level of capitalization, credit risk, liquidity risk, riskiness of overall portfolio and GDP were statistical significant in BCC model. Other estimated determinants included in this model were not statistical significant. It can be seen that level of capitalization, credit risk, liquidity risk and riskiness of overall portfolio had a positive impact on efficiency in the Czech banking sector. On the other hand, GDP had and number of branches had negative impact on banking efficiency in the Czech banking industry.

We can conclude that banks with a higher ratio of loans to deposit and a higher ratio of loans to total assets were more efficient than other Czech commercial banks. We found a positive relationship between the level of capitalization of the Czech commercial banks and banking efficiency. Next result is that the gross domestic product per capita had a negative impact on banking efficiency in the Czech banking industry. This result confirm the conclusion of Grigorian and Manole (2002), Altunbas *et al.* (2007), Chortareas, Girardone, and Ventouri (2009) and Vu and Nahm (2013) in banking sectors.

Conclusion

The aim of the paper was to examine the determinants of banking efficiency in the Czech banking sector over the period 2001-2013. First, we employed the Data Envelopment Analysis to estimate the efficiency of the Czech commercial banks during the period 2001-2013. We found that the most efficient bank was Sberbank and the lowest efficient bank was Československá obchodní banka. Next, we estimated determinants of banking efficiency using panel data analysis. We found that in both model the level of capitalization, credit risk, liquidity risk and riskiness of portfolio had a positive impact on banking efficiency and GDP a negative influence on efficiency of the Czech banking industry. Concentration, interest rate and return on assets had a positive impact on banking efficiency in model with constant return to scale. The results show a negative relationship between market share and efficiency in CCR model. On the other hands, number of branches had a negative impact in BCC model. Large banks were lower efficient than other banks in the banking sector. It is confirmed the results of regression analysis that market share had a negative impact on banking efficiency. Banks with a higher ratio of loans to deposit, ratio of loans to assets, higher ratio of equity to total assets were more efficient than other commercial banks in the Czech banking sector. In CCR model and in BCC model, the impact of the ownership structure was not statistical significant during the analyzed period.

Acknowledgements

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THE CZECH INNOVATIVE ENTERPRISE

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Abstract:

Contemporary the Czech government support own innovative solutions of the Czech entrepreneurs instead of accepting developed technology of foreign owners. One of the possibility of own innovative solution is establishing of start-ups and spin-offs such as selected innovative form of enterprise. These entities are mostly small and medium sized enterprises that realize their activities in the field of information and communication technologies. Starting this enterprise is difficult and to reach their viability there is necessary to support their beginning by innovative institutions. Research and technology centres and business incubators are contributing to this. The aim of this paper is to evaluate entrepreneurship of start-ups and spin-offs, including business incubators in the Czech Republic through real empirical investigation and also to find differences between Czech start-up entrepreneurs and Israeli businessmen. Final part of the paper is focused on determining the basic characteristics of these firms, possibility of financing and ways of evaluating the success.

Keywords: innovative enterprise, start-ups, spin-offs, business incubators, small and medium sized enterprises.

JEL Classification: M13

1. Introduction

Contemporary world of business is changing significantly. Business perspectives are still more often connected with new scientific findings, their applications and quick transfers of technology globally. Various forms of innovative entrepreneurship contribute to the transfer of the research and development results to an industry. Enterprise (according to new Eurostat methodology from 2010) which in given period introduced product innovation or process innovation or had ongoing or interrupted innovation activities (technical innovation), or implemented marketing or organizational innovation (non-technical innovation) is considered as innovative enterprise.

2. Contemporary statistical data about the Czech innovative enterprise

According to the Czech Statistical Office that realises statistical surveys in two-year cycles in years 2004 – 2012, 50% of all enterprises were innovative enterprises. It means that each second enterprise innovated as seen in figure 1.
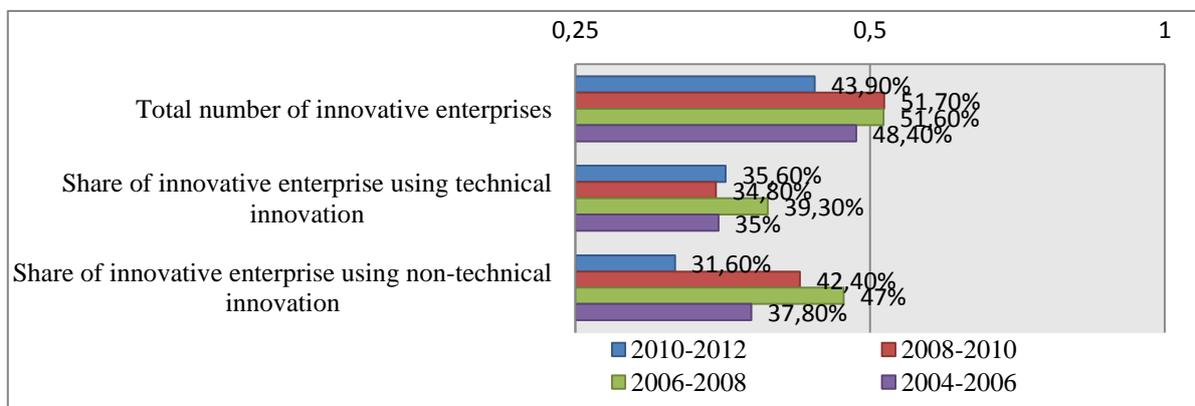
Source: Czech Statistical Office, 2014

Figure 1 - Share of innovative enterprises including technical and non-technical innovation

Figure 1 shows that period 2006 – 2008 was the best for innovations (55%), while in 2010-2012 only 43.9% of all economically active enterprises were innovative enterprises. In 2004-2008 innovative activities were mostly non-technical on the other hand in 2010-2012 technical innovative activities (35.6%) dominate over non-technical innovations (31.6%).

In the field of information and communication activities the biggest number of innovative enterprises (64.8%) can be found. In this field enterprises introduced mostly technical innovations (57%) and also non-technical innovations (45.7%). Another branch with high share of innovative enterprises is finance and insurance (55.9 %). In manufacturing industry the share is 48.3%. In both branches enterprises are more focused on technical innovations than on non-technical as shown in Figure 2.

Source: Czech Statistical Office, 2014

Figure 2 - Share of innovative enterprises from the whole number of enterprises according to type of innovative activities in chosen branches CZ-NACE in 2010-2012

On the other hand enterprises in mining and quarrying were innovating very rarely. Figure 2 shows that in finance and insurance technical innovations dominated over non-technical.

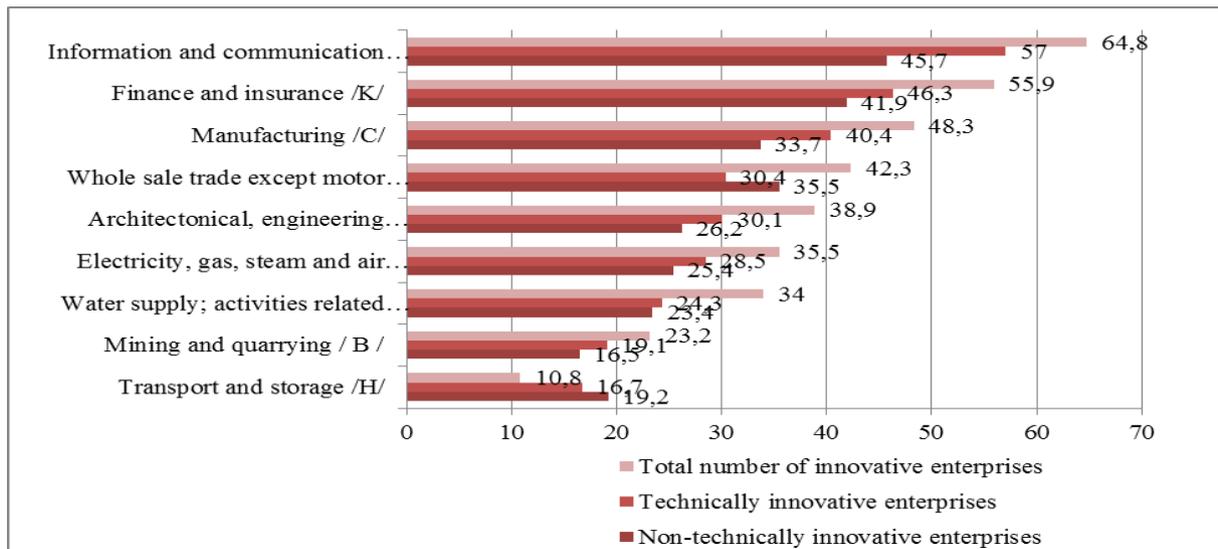If we compare the Czech enterprises with the EU enterprises by Eurostat then enterprises in the Czech Republic in terms of innovations scale are slightly above the European average. In terms of the extent of innovations, the best enterprises are in Germany (approx. 80 %). The lowest tendencies towards innovations on were recorded in Latvia, Poland and Hungary (below 30 %). Each firm is required to survive by making internal changes to anticipate any changes in business and market demands (Rahab 2012).

Current situation of innovative entrepreneurship leads to searching for the ways how to develop and support it. One possibility is to support the development of start-ups and spin-offs that contribute to transfer of new knowledge and innovative solutions. Start-ups and spin-offs are very innovative small and medium sized enterprises that do not have enough capital. But they are expected to generate high profit after they overcome initial barriers. In the case of these companies starting a business is difficult. To reach their viability there is necessary to support their starting by variable innovative institutions. Research and technology centers and business incubators contribute to it. Business incubators are very important, because they provide discounted rent, consulting services in particular business and some other services. The incubation period in business incubator is usually from one till three years that are enough for the firm to become established business entity and become a part of wider enterprise environment (DEWRSB 2001, 128). It seems that firms that use support in technological center during starting period have 90% chance to survive.

In the Czech Republic business incubators started to appear in 2004 (when the Czech Republic became a member of European Union), because of the opportunity to use financial resources from structural funds. In this country there are differences among regions in the sense of number of incubators and also provided services. Start-up activities are supported also by CzechInvest and Ministry of industry and trade, which organize project named CzechAccelerator. The aim is to support penetration of the Czech start-ups to the foreign markets. Even if there exist variable forms of enterprises supporting emergence of start-ups and spin-offs, there is not a big number of them. Israel, whose size corresponds to the Czech Republic, one start-up company after another without any major problems appears there. In the Czech Republic we can see a different situation. There does not exist any institution controlling and managing starting and running start-up firms. Situation is similar in the case of spin-offs that are linked with the universities. There exists a lot of logistic parks in the Czech Republic. It was found that there are many new logistic parks in the Czech Republic, whose launch was often facilitated by the state and more parks are under construction (Jurásková, Macurová 2013).

On the basis of realized empirical survey this paper monitors start-ups and spin-offs in the Czech Republic, brings determination of these firms' characteristics and finally this paper points out differences between enterprise environment in the Czech Republic and Israel.

3. Theoretical literature overview

3.1 Determination of start-up firm including financing

According to the English-Czech explanatory dictionary start-up is something such as a new business you create or cause to start. There exist a number of definitions of start-up firm from the business point of view. According to Duda start-up is a starting firm that builds its core business on innovative idea (DUDA 2013). It means that start-up firm brings new product or this firm produces it on the basis of new technological processes or provides services in the way no one else knows. Similarly author Audretsch (2011) defines start-up firm. It is a firm that offers new products, uses new way of production or opens up new markets to customers or suppliers. This author also identifies innovative start-ups according to the rate of inputs or value added related to research and development. Firms or branches are innovative if the firms invest more than 3.5% of its inputs to research and development. And they are "high-tech" in the case this rate is higher than 8.5%. But there is not determined which inputs are considered to be research and development inputs.

The main goal of a start-up is to grow or to achieve better position in the market compared to competitors. Founders of these firms focus on finding a market niche in the industrial branch they aim to fill and to create a temporal monopoly (Bartoš 2002). For start-ups at the beginning it is very important to focus on its development not only to be focused on results. Business incubators help start-ups with this development – they provide quality consulting services or help them with the education. At the same time start-up firm success is related to "Start-up feeling". It means to be enthusiastic while starting own business. But in many cases when this enthusiasm disappears a promising firm becomes "grey mouse" and its activities slowly finish. Common characteristics of existing definitions describing start-up firm are: newly established firm, new innovative solution, needed support of business incubator, core business is mainly information and communication technology and necessary start-up feeling.

For development start-up firms use following source of financing (Srpová 2008, 2010):

- Own sources – they enable immediate starting business and founder is the only one owner. But financing by using own sources is more difficult and slow.
- Bank loan – total costs connected with loan are relatively high. But in the case firm pays its payables regularly the bank does not want to influence business activities of the debtor (Srpová 2010).
- Factoring – entrepreneur advance his claim to factoring company, that accepts all the liability and entrepreneur has his money immediately.
- Business angels – investors which for longer period invest own money to start-up firms with high potential and takes fair share from the entrepreneurship. Except money business angles provide also know-how and contacts (Woods 2008).
- Venture capital – is capital invested to starting, running and further development of start-up firm. Capital is provided and there is expected share in firms registered capital.

- Private equity – private capital provided starting firms in order to gain share in registered capital. In return for their money, knowledge and experiences capital providers require significant asset share.

Choice of way of financing start-up firms relate to actual firm lifecycle period (establishing, growing, expansion, maturity). Innovative firms face important business risks in the time they start and develop new products. Basically two situations can happen: firstly new product can be unsuccessful or on the other hand product can be successful and can generate more than average profit.

3.2 Determination of spin-off firm

According to the English-Czech explanatory dictionary spin-off is something useful that unexpectedly results from an activity. Poláček and Attl (2006) define a spin-off firm (sometimes we can find spin-out) as one that rises by using intangible assets as capital stock into a newly rising corporation (e.g. university know-how). Shane (2004) defines a university spin-off firm such as a newly established firm that partially uses intellectual assets that come from some university.

Spin-off firm is founded in order to use and develop intellectual property of university in the form of product or service accepted in the market. Students or researchers of university usually found this kind of firm and they use know-how, knowledge and findings they obtained at the university. Firms can have this intellectual property from the university when they pay for it or sign a licence. Spin-off firm can be founded with a share of university or without it. Kislingerová (2011) divides spin-offs into two groups:

- Spin-offs that are founded by academics and are its employees or by students;
- Spin-offs that are founded by university graduates.

Literature focused on spin-offs emphasizes the key role of the researcher who becomes a manager (Lockett *et al.* 2003; Murray 2004). According to a case study of Turin (Salvador, 2010) local spin-offs are young firms with a low capital and few employees. Most of these entities are service firms rather than product ones. The main sector of activity is biotechnology and chemical-pharmaceutical, aerospace and transport, informatics and telecommunication and environment. These are the sectors in which Turin incubators and science parks as well as the Polytechnic and the University, are most specialized. These spin-offs are micro-firms but deal most of all in the international market (Salvador 2010). According to the literature, spin-off founders are influenced by a desire of autonomy and independence (O`shea *et al.* 2005; Shane 2004), and possibility to use reached research results.

It is necessary to consider the results of the case study of Turin which was based on interviews and answers of the questionnaire. It was determined that in general, academics choose not to leave university jobs (Salvador 2010). The fact is that the inventor does not have to run a new firm every day. He can be involved in technical activities of the innovation (Wright *et al.* 2004b). The growing role of science parks in helping universities balance their 21th century missions in education, research and commercialization is necessary (Wessner 2009). According to statistical results of Link and Scott (2007) "the organizational nature of the university-park relationship is important". Universities with a connection to spin-off firms are key tool for implementation of research results. The positive attitude of universities toward spin-offs is a recent phenomenon (Wright *et al.* 2004b; Shane 2004).

The major difference between start-ups and spin-offs is in its founder. Spin-offs are usually founded by students or researchers of particular university or former university graduates. In the case of start-ups any kind of private person can be its founder.

3.3 The differences in approach to entrepreneurship in selected countries

According to Srpová (2008) and Kuratko (2011) the main assumption to success in business are entrepreneur characteristics and his or her approach to realizing business activities. The most important entrepreneur features are perservance, responsibility and initiative. At the same time entrepreneur has to monitor and utilize opportunities and own strengths, apply concept of price, quality and flexibility in accordance to entrepreneur environment. Entrepreneur features are till certain extend influenced by his values, habits and culture of particular country. It can be inspiring to compare approach to entrepreneurship in the Czech Republic and Israel as shown in Table 1.

Table 1 - Features of approach to entrepreneurship in selected countries

Czech Republic	Israel
An effort to succeed in entrepreneurship	High level of motivation to be successful in entrepreneurship.
Business is based on the certainty and risk avoidance.	High level of risk is accepted in business.
Entrepreneurs use appearing opportunities.	Entrepreneurs search for new opportunities.
Solution: avoiding problems	Solution: to be able to enforce
Main feature of entrepreneur: persistence	Main feature of entrepreneur: rapacity

*Source***:** Authors compilation

Israel has more start-up firms than any other country in the world (except USA) and at the same time Israel has higher investment capital per a person than any other country. This country does not have as much natural resources as the Czech Republic, but there can be seen a different attitude to disadvantages this country has. Israel tries to transfer disadvantage to advantage and change disfavor to creative energy. Global problems are solved at local level. Military history and migration is an important base for success. Innovation results from commitment and willingness to risk. This country attracts experienced professors and researchers. Success of Israelites is in their nature that is influenced by their culture. They are more fierce and they are not afraid to risk, they do everything they can to achieve their goal. They are able to defy authorities instead of obey the command from above. In contrast, the Czechs do not like to run the risk, they choose security rather. The Czechs prefer to avoid the problems they should deal with. They are not successful in getting the scientifics back to their country. We assume that approach to entrepreneurship and existing framework of conditions for doing business to certain extend influence enterprise activities related to start-ups and spin-offs establishment.

4. Empirical survey

4.1 Description of empirical survey and research sample

Empirical survey was realized by questioning in selected incubators in 2012. This research was focused on gaining data about activities of start-ups and spin-offs. All the incubators that were monitored were contacted by email or phone call. 24 incubators were asked for cooperation at questioner survey. 6 of them did not provide needed data. The main sense of the realized survey was getting the review about the number of newly raised start-ups and spin-offs in their fields of operations, about the length of their existence, average length of cooperation with incubator and preferred services that are provided by incubators. In order to get these data there was worked out a list of 10 questions and the management of these incubators provided answers.

Absence of any institution that would register at least number of incubators in the Czech Republic influenced quality of research sample. It means that contacted number of incubators may not match real number of existing incubators in the Czech Republic. At the same time some incubators that were asked for the needed data did not provide any feed-back. Research sample of the empirical survey was 18 business incubators. Five incubators from the whole group of 29 incubators finished its activities. 6 from the remaining 24 incubators were not interested in our survey.

4.2 Empirical survey results

The biggest number of incubators is in Moravian-Silesian Region (the number is 6). On the other hand the smallest number of incubators (one in each region) is in Pardubice Region, South Bohemia Region, Hradec Králové Region, Olomouc Region and Pilsen Region. The biggestt group of incubators (44 %) realizes its activity from four to six years; the second biggest group (33 %) is the group of incubators that provides their services for more than 6 years. Only 23 % of all monitored incubators exist three or fewer years. The oldest incubator is BIC in Brno (21 years). The second oldest incubator is BIC in Pilsner and Podnikatelské a inovační centrum in Most (15 years). The

incubator that provides the largest area of square kilometres for starting entrepreneurs is Technology incubator VUT in Brno (7 000 m2). Provided services do not differ too much in particular incubators. Very often the founders of business incubators are universities together with towns. There is the same amount of incubators founded by town as well as by university.

It was found out that business incubators help more start-ups than spin-offs. Innovative entrepreneurship by using spin-offs is not so enhanced. Because of that we evaluate together number of start-ups and spin-offs. The biggest number of start-ups (280) was arisen since the beginning of existence of Podnikatelské a inovační centrum BIC Brno in South-Bohemia Region. Podnikatelský inkubátor and vědeckotechnologický park (Moravian-Silesian Region) have had 130 firms. Technologický inkubátor VUT (South Moravian Region) have had 119 firms. The numbers of incubated firms in particular regions (start-ups and spin-offs) are at the Table 2. All three incubators provide their activities more than 3 years. So that we can presume that these incubators are well operated and well-established incubators that have their experiences. At the same time we can deduce that incubators that operate shorter time have smallest number of start-ups and spin-offs as shown in Table 2.

Table 2 - Number of firms that entered particular incubators

No	Incubator`s name	Region of location	No of firms in incubator
1	Podnikatelský inkubátor a vědeckotechnologický park	Moravian-Silesian Region	130
2	IDEA inkubátor (Vědeckotechnologický park Ostrava)	Moravian-Silesian Region	16
3	Technologický inkubátor (Vědeckotechnologický park Ostrava)	Moravian-Silesian Region	25
4	Podnikatelský inkubátor VŠB-TU Ostrava	Moravian-Silesian Region	63
5	Podnikatelský inkubátor VŠP Ostrava	Moravian-Silesian Region	9
6	STEEL IT - Inkubátor Třinec	Moravian-Silesian Region	No data.
7	Podnikatelský inkubátor při VŠE v Praze	Prague	45
8	Technologické a inovační centrum ČVUT (Inovacentrum)	Prague	60
9	Inovační centrum a podnikatelský inkubátor (Technologické centrum AV ČR)	Prague	No data.
10	Technologické inovační centrum ČKD Praha	Prague	90 - 100
11	Centrum biologických technologií, Nové Hrady – biotechnologický inkubátor	South Bohemian Region	No data.
12	Třeboňské inovační centrum	South Bohemian Region	No data.
13	Technologický inkubátor VUT	South Moravian Region	119
14	Podnikatelské a inovační centrum BIC Brno	South Moravian Region	280
15	Vědeckotechnický park Brno-Jih	South Moravian Region	No data.
16	Podnikatelský inkubátor technologického centrum Hradec Králové	Hradec Králové Region	40 - 50
17	Podnikatelský inkubátor Vědeckotechnického parku Univerzity Palackého v Olomouci	Olomouc Region	No data.
18	TechnoPark Pardubice	Pardubice Region	No data.
19	BIC Plzeň	Pilsen Region	62
20	Podnikatelský inkubátor Nymburk	Middle Bohemia	22

No	Incubator`s name	Region of location	No of firms in incubator
		Region	
21	Vědecko-technický park Mstětice	Middle Bohemia Region	No data.
22	VYRTYCH – Technologický park a Inkubátor, Březno	Middle Bohemia Region	11
23	Technologický park a inkubátor Řež	Middle Bohemia Region	3
24	Podnikatelské centrum Rumburk	Usti Region	No data.
25	Podnikatelské a inovační centrum, Most	Usti Region	11
26	Technologický park Chomutov	Usti Region	No data.
27	Inovační infrastruktura s. r. o. - Podnikatelský inkubátor Kunovice - Panský dvůr	Zlín Region	29
28	Podnikatelský inkubátor Vsetín	Zlín Region	24

Source: Authors compilation

     In all incubators the sphere of operating is mostly information technology (programming) and information activities (activities that are connected with web portals, elaboration of data and hosting). Other activities are electro-technology, environmental technology, engineering, building industry and robotics. The average length of cooperation of start-ups and spin-offs with incubator is about 36 months. At the same time it was found out that if there exists a science-technology park in particular region further cooperation is transferred towards this park. The incubators offer nearly the same services and also firms require services that do not differ too much. They provide e. g. area for operating for privilege price, advices in the sphere of financing the projects, help with business plan, advices in the field of law, accounting and taxes etc. Start-up firms usually do not use financial resources from foreign investors (risk funds) such as business angels. Only a third (6) of all incubators wrote that only 10 % of all newly established firms were successful in gaining finance resources from foreign investor.

     Rise of start-ups brings also new working places (employment). The biggest number of work places (670) was created in firms in IDEA incubator and the smallest number of new work places (maximum 10) was created in firms situated in Technologický park and inkubátor Řež. Our finding is that number of newly created work places relates to the length of existence of incubator and scope of business of newly established firms. According to gained finding about start-ups and spin-offs in Table 3 there are determined the main characteristics and differences of start-ups and spin-offs.

Table 3 - Start-up and spin-off characteristics

CRITERIA	START-UP characteristics	SPIN-OFF characteristics
Scope of business	Mainly information technology and related activities	According to realized survey it cannot be determined conclusively
Firm size	Small and medium	Small and medium
Character of entrepreneurship	Doing business with lack of capital and expecting high profit after overcoming initial barriers	Doing business with lack of capital and expecting high profit after overcoming initial barriers
Owner	Individual (private person)	University, individual
Level of risk connected with business	High	High
Length of incubation	Maximum 36 months	Maximum 36 months

CRITERIA	START-UP characteristics	SPIN-OFF characteristics
period		
Idea	Very innovative firm bringing new innovative solution	Very innovative firm bringing new innovative solution
Financing	Using own financial resources and money from gained projects. Money from foreign investors (e.g. Business angels, private equity etc.) is not used very often.	Using money from university and from various projects.

Source: Authors compilation

Start-ups and spin-offs have many common characteristics such as length of stay in business incubator, size, high level of risk or expectation of further high profit.

Conclusion

We suppose that nowadays the activity of creating start-ups and spin-offs is in the Czech Republic very low. It is mainly caused by lack of shared experiences from the field of setting up and running these companies and also by lack of financial resources on the side of the founders. This situation also comes out of an attitude to enterprise and level of entrepreneurship in the Czech Republic.

In the Czech entrepreneurial environment we can observe unwillingness to take a risk connected with entrepreneurship, lack of entrepreneurial spirit and low export activity of small and medium sized firms. Higher potential is seen in young individuals especially graduates. The most important barriers in entrepreneurship are lack of financial resources, courage and missing idea. On the other hand among the factors of motivation belong financial benefits, flexible working hours and using own abilities and potential.

It follows that it is necessary to support potential of young people by efficient awareness of possibilities of gaining financial resources, spreading out experiences of successful entrepreneurs in order to reduce fears of business and also organize programs for development of entrepreneurial spirit.

For gaining more detailed data about start-ups and spin-offs it is necessary to work out a central evidence of the number of these entities and to evaluate the vitality of chosen sample by using Blues Methodology. Interviewer asks an entrepreneur questions considering important criteria and an entrepreneur answers the questions. Blues Methodology evaluates business entities in seven spheres (product, customers, finance, information, people, processes, motivation). This methodology also accepted a system of evaluation from EFQM model. Each business entity can obtain a certain number of points and later it is possible to compare chosen enterprise with the best one in particular branch or with industry average.

On the basis of realized survey of business incubators authors of this paper will continue in choosing a sample of start-ups and spin-offs and will use Blues Methodology for their evaluation.

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LONG RUN FISCAL DISEQUILIBRIUM.
AN INDONESIAN CASE

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Abstract

This study attempts to provide an evidence of fiscal disequilibrium in Indonesia. The model considers elaborating government expenditure model. For this purpose, this research employs an error correction model to test the existence of fiscal equilibrium. In this case, the model captures output, population, and tax revenue as the determinant variables of government expenditure for the period 1970-2012. The short run model shows that population and tax revenue are statistically significant in affecting government expenditure. Meanwhile, changesin tax revenue has negative effect to government expenditure growth which potentially creates fiscal gap. Furthermore, this finding reveals the existence of fiscal disequilibrium in Indonesia. Furthermore, these findings recommend that government likely considers increasing tax ratio rather than reviewing government size.

Keywords: fiscal, government, expenditure, budget, deficit, policy.

JEL Clasiffication: H 53, H 62, C 22

1. Introduction

The issues of fiscal policy and public finance management have been a long interest of many economists. Tanzi (1982) initiated an analysis of fiscal disequilibrium in developing countries. In his paper, he pointed out that the causes of fiscal disequilibrium are export boom, price inelastic tax system, public enterprise performance, increased expenditure produced by political exigencies or administrative weaknesses, and worsening terms of trade. Other issues that emerged in some papers are fiscal imbalance as well as the debate of optimum government size and its relationship to other main macroeconomic variables (Auerbach 2011). Moreover, Ekinci (2011) noted that expansion of government size even slows down economic growth. In most developing countries, government size has positive correlation with government expenditure which generally grows annually.

Following Sobhee (2003), the attempt to provide an empirical model of demand for public goods could be inferred as an alternative way to find a proper government expenditure. In recent years, Indonesian economy has experienced a stable growth rate averaging five per cent in real terms, thereby improving the macroeconomic fundamentals including the public finances. Thus, it would be interesting to capture the evolutionary forces that have governed the fiscal policy in Indonesia over the last three decades through modelling the government expenditure.

A major problem of recent Indonesian fiscal management is to avoid fiscal trap that could trigger a new economic crisis. One of the important dimensions of this challenge is to conduct fiscal policy to support a stable economic growth, low inflation, and increasing employment. Furthermore, the central government has applied an expansionary fiscal policy in the last decade. However, this policy could not boost fiscal capacity in this period. During this time, Indonesian government has been experiencing sharp increases in its expenditure which has lead to a stable economic growth. Based on Indonesia's finance ministry report 2012, government expenditure grew by 282.8.7% from 2002 to 2011; meanwhile the tax revenue only increased by 243.7% in the same period. However, the significant increase in government budget did not mean that the fiscal capacity has become more stable. A simple indicator is that government expenditure has grown faster than its of government revenue, potentially making the government embark upon a potential fiscal trap.

As concluded by Marks (2004), it seems the government budget was not sustainable in the long run in Indonesia. The budget structure was imbalanced, where government expenditure grew faster than revenue as a consequence of exchange rate volatility. The government expenditure was dominated by operating expenditure which might not seem to be potential to create new tax sources. Unfortunately, the vulnerability to external shock, such as world oil price could undermine the fiscal sustainability given the huge proportion of oil subsidy in the budget. This phenomenon is reliable reason to analyze fiscal equilibrium in order to provide an alternative prudent fiscal policy. In this

paper, we intend to extend the analysis of fiscal equilibrium by modelling an empirical evidence of government expenditure.

2. Literature review

Fiscal equilibrium occurred on the condition that permanent government expenditures were covered by permanent government revenues (Tanzi 1982). Some papers have focused on the analysis of government expenditure behaviour for various data. The analysis mostly concerns with the relationship between government expenditure and other economic variables, such as tax revenue, economic growth, and government budget deficit (Ghartey 2010; Sobhee 2003; Tsaurai & Odhiambo 2013). The development of government expenditure could be traced back to Wagner´s law which states that government activity increases as the economy grows. (Sobhee 2003) provided additional insights through the empirical evidence of the demand function for the public goods in a developing small economy. He first established a long-term relationship between quantity demanded of public goods, median voter's income, price and population. Supporting evidence in favour of the Buchanan and Wagner hypothesis, he found that fiscal deficit have led to a reduction in the perceived tax-price of public goods that have further increased public spending.

Ekinci (2011) noted that a positive share of government in economic activities changes downward as the relative size of government grows. The demand for public goods rises and is consistent with the increasing ability to collect the necessary funds. As countries become more developed, higher demand for public goods which automatically leads to increased government expenditure also requires an increase in tax revenue. Schaltegger & Torgler (2006) as well as Nurudeen & Usman (2010) revealed that government expenditure negatively influenced economic growth. This result was not in line with Ghosh & Gregoriou (2008) who found that government expenditure play a strong positive impact on economic growth. (Tsaurai & Odhiambo 2013) pointed out that there is a unidirectional causal flow from economic growth to government expenditure, both in the short run and in the long run.

Some recent studies support an active fiscal policy as an implementation of the Keynesian proposition (Hall 2009; Ramey 2011; Ratha 2012; Saleh & Nair 2006). The Keynesian theory proposes the role of expansive fiscal policy to support aggregate demand and economic growth. The government expenditure should act as a stabilization policy and increasing during the recession, while it should be reduced during the economic booms. This concept recommends an active fiscal policy and relies on the size of government expenditure.

The budget constraint proposition explains that government expenditure equals with sum up of tax revenues, budget deficit and increase in borrowing. In a balance budget system, an increase in taxes is followed by an increase in government expenditure. Thus, there is a causal relationship between changes in government spending and taxes (Ghartey 2010). According to Tanzi (1982), to avoid fiscal disequilibrium, a country with rapid increase government expenditure must consequently attempts to raise taxes revenue. (Ghartey 2010) also found that in developing countries, reduction in taxes is commonly means of controlling government spending. The attempt of governments to raise taxes in reducing budget deficit could be the principal source of fuelling higher spending. Thus, in an increasing tax, then lead to cause government spending to increase. Furthermore, reducing or limiting tax receipts in the short-term and constraining government expenditure create cost of government activities in the long-run. In this situation, a country tends to meet a fiscal disequilibrium in the long run.

Another interesting finding of the study conducted by Ghartey (2010) was that in the short-term rises in taxes cause government spending changes for some developing countries. Meanwhile, in the long-run, taxes and spending remain independent because the government which controls both fiscal instruments has failed to balance the national budget. However, government spending tends to be disbursed without considering sources of financing. Several previous empirical results also described similar situation (Baghestani & McNown 1994; Narayan & Narayan 2006). Empirical analysis of government expenditure model will provide insight as to how fiscal policies might help to control the government expenditure growth. If the factors affecting government expenditure could be elaborated, then it will be expected to provide some strategies in the government budget management. In contrast, the impact of revenue growth on government expenditure is also a significant

consideration for government to strengthen the fiscal capacity. These are the importance of examining the government expenditure model on the fiscal policy implementation.

3. Model specification and method of analysis

In line with the objective to analyze the long run behaviour of government expenditure, this research employed cointegration and error correction model (ECM) as widely used in previous researches (Ghartey 2010; Khan 2012; Sobhee 2003; Tsaurai & Odhiambo 2013). This approach does not only encompass both level and difference in the variables which capture the short and long run properties of the model, but also provides an attractive statistical framework and represents the concept of long run relationship between two or more variables. With respect to the concept of cointegration, we need to analyze the time series properties of economic variables. In the case where the variables in question are not stationary or cointegrated series, the regression equations related to time series data are spurious. It means that testing for unit root and cointegration can be considered as a pre-test before estimating a valid ECM regression.

A complete consideration of dynamic specification including ECM is important in construction of economic models. The dynamic analysis involves the description of some economic variables as a function of a set of lagged explanatory variables. With respect to this issue, this section explains error correction model adopted from Tsaurai & Odhiambo (2013).

To illustrate the government expenditure model, the economy can be assumed in long run equilibrium. In the case of the government sector, it can be assumed that government expenditure adjusts periodically to its equilibrium. This may be caused by some economic variables that probably come from both endogenous and exogenous variables. According to Sobhee, (2003), long run model of government expenditure may be formulized as follows:

$$G^* = A\, Y^b\, N^c\, T^d \tag{1}$$

The long run model of government expenditure (G^*) is assumed to capture output (Y), population (N), and government revenue (T). In linear log form, equation (1) will be:

$$\text{Log } G_t^* = \text{Log } A + b\, \text{Log } Y_t + c\, \text{Log } N_t + d\, \text{Log } T_t + \mu \tag{2}$$

If the adjustment of expenditure *G* to its long run equilibrium *G** is gradual, then the level of expenditure will respond to changes in independent variables, and *G* will move gradually toward its equilibrium level. Following Ghartey (2010), to capture this process we adopted a general autoregressive distributed lag model in period *t*:

$$\text{Log } G_t = a + b_1 \text{Log } Y_t + c_1 \text{Log } N_t + d_1 \text{Log } T_t + b_2 \text{Log } Y_{t-1} + c_2 \text{Log } N_{t-1}$$

$$+ d_2 \text{Ln } T_{t-1} + \beta \text{Log } G_{t-1} + \varepsilon_t; \tag{3}$$

To reflect the steady state, equation (3) can be rearranged as the error correction model:

$$\text{Log } G_t = a + b_1 \text{Log } Y_t + c_1 \text{Log } N_t + d_1 \text{Log } T_t +$$

$$\lambda\, [\text{Log } G_{t-1} - \delta(\text{ Log } Y_{t-1} + \text{Log } N_{t-1} + \text{Log } T_{t-1})] + \varepsilon_t \tag{4}$$

$$\text{Log } G_t = a + b_1 \text{Log } Y_t + c_1 \text{Log } N_t + d_1 \text{Log } T_t + \lambda\, ECT_{t-1} + \varepsilon_t \tag{5}$$

In equation (5), it implies that b_1, c_1, and d_1 are the short-run elasticity of government expenditure with respect to output, population, and government revenue respectively. While the error correction term (ECT_{t-1}), which is λ [Ln G_{t-1} - δ(Ln Y_{t-1} + Ln N_{t-1} + Ln T_{t-1})], explains level of deviations from short run disequilibrium to the long-run equilibrium, and where δ is the long-run elasticity of government expenditure with respect to all independent variables. In addition, λ is

expected to be statistically significant. This coefficient also reflects the level of adjustment of government expenditure from its past disequilibrium.

Moreover, to examine the existence of a co-integration relationship between government expenditure and its dependent variables this research uses the recently developed ARDL-bounds testing approach. According to Tsaurai & Odhiambo (2013), the ARDL model used in this study can be expressed as follows:

$$\Delta \text{Log G}_t = a + \sum_{i=1}^{m} b_i \, \Delta \text{Log Y}_{t-i} + \sum_{i=1}^{n} c_i \, \Delta \text{Log N}_{t-i} + \sum_{i=1}^{p} d_i \, \Delta \text{Log T}_{t-i} +$$

$$\sum_{i=1}^{q} e_i \, \Delta \text{Log G}_{t-i} + \varphi_1 \text{Log Y}_{t-1} + \varphi_2 \text{Log N}_{t-1} + \varphi_3 \text{Log T}_{t-1} +$$

$$\varphi_4 \text{Log G}_{t-1} + v_t \tag{6}$$

The long run model is estimated by normalizing the coefficients of the lagged dependent variables in equation (6). To provide an estimable technique to test the existing of long run dynamic equilibrium between government expenditure and its explanatory variables, this equation could be written in other form as follows:

$$\Delta \text{Log G}_t = a + \sum_{i=1}^{m} b_i \, \Delta \text{Log Y}_{t-i} + \sum_{i=1}^{n} c_i \, \Delta \text{Log N}_{t-i} + \sum_{i=1}^{p} d_i \, \Delta \text{Log T}_{t-i} +$$

$$\sum_{i=1}^{q} e_i \, \Delta \text{Log G}_{t-i} + \lambda \, \text{ECT}_{t-1} + v_t \tag{7}$$

A negative and significant error correction term (λ) would indicate co-integration that is long run equilibrium among the underlying variables (Ghartey 2010). The optimum lag length of the ADL model is chosen by using information criteria such as Schwarz criterion (SBC) and Akaike information criterion (AIC). The error correction term also measures the speed of adjustment from short run deviations to a long-run equilibrium. If it is statistically significant and has negative sign, it means that the set of variables are cointegrated. The Johansen, (1991) cointegration technique is used to test the long run equilibrium relationship among the variables of interest.

4. Empirical results and discussion

This research employs annual data which include government expenditure (G_t), Gross Domestic Product (Y_t), population (N_t) and tax revenue (T_t) for the period 1970-2012, all of which are in natural logarithm of real terms. Data are obtained from several annual reports of International Financial Statistics, World Bank.

Figure 1 reports the behaviour of government expenditure and tax revenue. Government expenditure sharply increased in the period of 1985-1997, as well as tax revenue. Because of financial crisis that occurred in 1997, both variables tend to have lower growth until 2010. The lower value of tax revenue comparing to government expenditure implies that the government experiences budget deficit which slightly declined in 1990-2000. For the rest of the period, budget deficit was in a moderate level which is successfully controlled around 2% of GDP. Other important fiscal indicator, Indonesia's tax ratio is around 12% of GDP which is only a half of the average in ASEAN countries that is around 24.5% of GDP. This low tax ratio could be caused by low tax rate, narrow tax base, or low compliance rate. Other factors that may cause this problem are weakness of institutional capacity and low quality of government staffs.
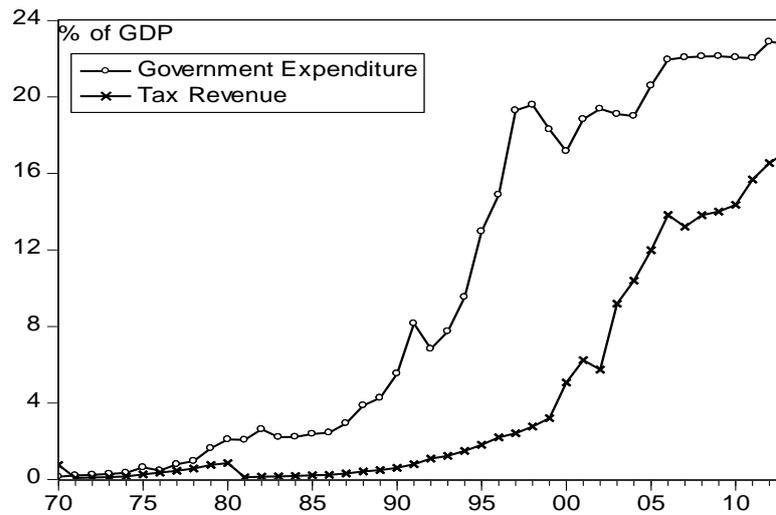
Figure 1 - Government Expenditure and Tax Revenue, 1970-2012

Table 1 presents the result of individual unit root tests of the data series with intercept and time trend component. Using Augmented Dicky Fuller (ADF) test, the null hypothesis of unit root on the level should not be rejected for all data series although at 10% level of significance. In contrast, the null hypothesis of unit root on the first difference could be rejected for all data series at least at 10% significance level. It indicates that these series are all stationary in first difference. Due to the Engle & Granger (1987), cointegration test will be valid if a set of series data is stationary and has the same degree of integration. Thus, cointegration test could be applied to estimate the long run relationship between government expenditure, output, population and tax revenue.

Table 1 - Result of Unit Root Test

Variable	Level		First Difference	
	ADF	Prob.	ADF	Prob.
Log G_t	0.063	0.959	-4.758[*]	0.000
Log Y_t	2.009	0.999	-2.731[*]	0.007
Log N_t	-1.184	0.672	-5.603[*]	0.000
Log T_t	0.127	0.964	-5.685[*]	0.000

Note: * Denotes rejection of the null hypothesis of unit root at the 0.05 level. Optimum lag based on AIC and SC for all data series are 2.

The cointegration test is reported in Table 2. Using Johansen procedure with intercept in the equation, one cointegrating vector is found for the empirical estimation. This result shows a long run relationship among variables in a set consisting government expenditure, output, population and tax revenue. Due to the presence of the cointegration, it indicates a corresponding error correction representation which implies that the changes in independent variables are a function of the level of disequilibria in the cointegrating relationship. According to Engle & Granger (1987), this mechanism is captured by error correction term, as well as changes in explanatory variables. In the same way, we will develop the model, which has some explanatory variables and error correction term obtained from the cointegration equation. Error correction model may be applied to explain the effect of explanatory variables to government expenditure in the short run.

Table 2 - Cointegration Test for Data Series: Log G_t, Log Y_t, Log N_t, Log T_t.

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	Probability
None *	0.4997	49.299	47.856	0.0363
At most 1	0.2913	20.900	29.797	0.3639
At most 2	0.1523	6.7776	15.494	0.6036
At most 3	1.04E-05	0.0004	3.8414	0.9853

Note: * Denotes rejection of the hypothesis at the 0.05 level.

Table 3 summarizes the empirical results based on the long run government expenditure model. These equations are estimated based on equation (3) and (5) which the dependent variables for both equations are in the level. In equation (3), we estimate government expenditure with lagged dependent and independent variables. Meanwhile, equation (5) is empirical model which has an error correction term to capture long run disequilibrium. Furthermore, we focus on this result to explain the long run model of government expenditure. The coefficient of error correction term in the model is significant which indicates the existence of fiscal disequilibrium from past period. The coefficient indicates that actual government expenditure adjusts about 55% annually from its past disequilibrium. This level seems likely high which leads the government to effectively achieving its equilibrium from previous year.

Table 3 - Estimation result of long run model

Independent Variables	Model 3: Log Government Expenditure		Model 5: Log Government Expenditure	
	Coefficient	t-statistic	Coefficient	t-statistic
Constant	-20.717	-2.116**	-73.742	-10.013***
Log Y_t	0.181	1.131	0.244	3.704***
Log N_t	-5.006	-0.692	6.301	9.967***
Log T_t	0.206	3.596**	0.333	5.247***
Log Y_{t-1}	-0.293	-1.746*	-	-
Log N_{t-1}	6.809	0.957	-	-
Log T_{t-1}	-0.094	-1.537	-	-
Log G_{t-1}	0.698	5.411**	-	-
ECT_{t-1}	-	-	0.550	3.459***
Adjusted R^2	0.992		0.984	
F statistic	637.3		620.8	
Durbin-Watson	2.249		1.781	

Note: All the data is in natural logarithm. ***, **, * indicate 0.01, 0.05 and 0.10 level of significances respectively.

The short run behaviour of government expenditure could be explained based on two empirical models in equation (6) and (7). These models consistently show that population and tax revenue significantly affect government expenditure. In contrast, output variable is not statistically significant although at 0.10 significance level. Generally, the model explains that in the short term, a change in population and tax revenue lead to increase in government expenditure growth. Equation (6) shows that lagged of tax revenue is not significant which indicate the absence of long run fiscal

equilibrium. Following Tanzi (1982) due to the fiscal equilibrium definition, this result warns the government to review the quality of budget governance, both for spending and revenue. As pointed out by Marks (2004), this finding also proposes that it is necessary for the government to strengthen the fiscal capacity by either reducing government size or increasing taxes revenue.

Table 4 - Estimation result of short run model

Independent Variables	Model 6: Δ Log Government Expenditure		Model 7: Δ Log Government Expenditure	
	Coefficient	t-statistic	Coefficient	t-statistic
Constant	-15.451	-1.395	-0.157	-1.717*
Δ Log Y_{t-1}	0.227	1.263	0.153	0.878
Δ Log N_{t-1}	13.49	1.827*	15.043	2.711**
Δ Log T_{t-1}	-0.130	-1.995*	-0.168	-2.759**
Δ Log G_{t-1}	-0.022	-0.122	0.045	0.277
Log Y_{t-1}	-0.088	-1.311	-	-
Log N_{t-1}	1.319	1.391	-	-
Log T_{t-1}	-0.008	-0.089	-	-
Log G_{t-1}	-0.090	-0.615	-	-
ECT_{t-1}	-	-	-0.057	-0.445
AIC	-0.799		-0.830	
SC	-0.426		-0.582	
Adjusted R^2	0.489		0.429	
F statistic	3.957		5.418	
Durbin-Watson	1.775		-	

*Note***:** All the data is in natural logarithm. **, * indicate 1and 5 percent level of significances respectively.

Based on the model (7), coefficient of error correction term in this equation is not statistically significant which indicates the changes in government expenditure did not adjust to the previous period's deviation from its equilibrium. Again, this finding might confirm that the government expenditure disequilibrium is not corrected yearly as also concluded by Sobhee (2003). As generally in the ECM, insignificance of error correction term means the model does not meet long run equilibrium. However, this result does not support the existence of fiscal persistence in Indonesia. According to Afonso, Agnello, & Furceri (2010), fiscal persistence can be considered as a measure of the degree of dependence of current fiscal behaviour on its own past developments. This result reveals the large gap between government expenditure planned and its realization reflects a weak budget capacity as also pointed out by Baldacci (2009).

According to Blanchard & Perotti (2002), components of ECT in equation (7) could be considered as quantitative estimate of the discretionary of fiscal policy in government spending. Our test shows that ECT is not statistically significant even though at 0.10 significance level which suggesting that there is no discretionary spending policy. Alesina, Campante, & Tabellini (2008) and Talvi & Végh (2005) pointed out that the absence of discretionary spending policy indicates that government has financial resource constraints. Furthermore, in the case of Indonesia, it was mainly indicated by low growth of taxes revenue and budget deficit shocks (Sriyana 2011). This phenomenon also potentially widens fiscal gap where government expenditure grows faster than the revenue increases. As noted by Tanzi (1982), rapid growth in government expenditure is a source of fiscal

disequilibrium. Furthermore, this finding confirms the existence of long run fiscal disequilibrium in Indonesia.

This estimation results exhibit that changes in population will lead to an increase in government spending in the short run, while an increase in output does not play an important role in determining government expenditure. In the case of Indonesia, lagged tax variable has negative coefficient which indicates that as tax revenue rises, it lowers government expenditure growth. This is suspected that an increase in tax revenue was not allocated into productive projects thereby potentially creating fiscal imbalance. This is a main problem in fiscal management as a result of fiscal disequilibrium. In other words, the fiscal capacity may be threatened in the future. It could be inferred that government should aware of fiscal disequilibrium threat that may caused by government expenditure growth in the next years. The government will potentially have a smaller capacity to finance its spending for both operating and development activities. Prudent fiscal policies to increase the tax ratio are rational option rather than cutting government spending.

Concluding remarks

This study attempts to provide an alternative evidence of fiscal equilibrium analysis in Indonesia. For this purpose, in this research we intend to extend the modelling of government expenditure using error correction model. The short run empirical model shows that population and tax revenue are statistically significant in affecting government expenditure change. In addition, changes in government expenditure did not adjust to the previous period's deviation from its equilibrium. This finding confirms that the government expenditure disequilibrium is not corrected yearly. However, this study does not support the existence of fiscal persistence and discretionary spending policy. The absence of discretionary spending policy indicates that government has financial resource constraints.

This finding explains an intensive effect of population change on government expenditure growth. This study also informs that lagged tax variable has negative correlation with government expenditure growth. This is suspected that increase in tax revenue potentially creates fiscal imbalance. Furthermore, this finding reveals the existence of fiscal disequilibrium in Indonesia. This is a main problem in fiscal management that arises from rapid growth in government expenditure. The government should avoid more severe fiscal disequilibrium threat in the next years by increasing tax ratio. Furthermore, this study considers increasing taxes revenue than reviewing size of government expenditure. Some alternative policies such as strengthening government institution and improving the bureaucracy capacity are more rational than government size.

Acknowledgment:

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THE PERFORMANCES ASSESSMENT - ASSESSMENT METHODS AND TECHNIQUES OF THE PROFESSIONAL PERFORMANCES

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Abstract:

The human resources management requires the continuous improvement of the employees ' activity in order to achieve the mission and organizational goals The advantageous use of the human resources management presupposes the existence of a system of performances assessment, of a system of the employees' boost and of a reward results system. The professional performances assessment of the company staff is a concern of the human resources management, with the multiple implications on all the other activities of the organization, influencing in a considerable measure the organizational climate, because with the help of this there can be determined the degree to which its employees achieve their responsibilities.

The need to appreciate the employees' professional performances generated the elaboration of the multiple methods and techniques of staff appreciation and gave birth to the systems of the performances assessment. More and more organizations are currently aware that they must have implemented their own professional performances assessment system for the employees.

Keywords: *assessment methods, criteria, professional performances, organization, human resources, employees*

JEL classification: M 54, M53

1. Introduction

Professional performances assessment of employees of an organization is an activity of the human resources management which is a spreading increasingly wider area, becoming a strategic activity in the process management of the human resources.

Professional performances assessment of employees from an organizational system constitutes an act of great responsibility, as it is the basis for the adoption of the strategic decisions affecting the future evolution of the entire system. From here, the need to use the most appropriate assessment methods and techniques arises, and the use of honest assessors to capture more accurately the actual situation of the assessed field.

Performances assessment should be undertaken as well as there would be expected of an institution activity, the juncture evolution of the economy is accompanied by numerous processes of change affecting, under quantitative and qualitative report the institution staff. These changes require a continuous assessment process of the results of the staff activity on chian of the entire existential flow of the human resources from the institution, starting from recruitment, evolution on hierachical scale taking into account the professional performances and the motivation according to the obtained results.

Knowing the carried out performances means a real understanding of the way how the tasks are met, how there is given the efficiency at work, it gives the confidence in self forces, constituting a mobilizer factor, a positive attitude towards the work.

Through the professional performances assessment there is established the reached level of the individual or group, at the analysis moment, giving the possibility of adoptions of decisions regarding the continuous improvement of it.

The purpose of the assessment is to assist in the taking of decisions that affects the individuals, decisions that should have an objective and fair foundation. The need for this activity is dictated by: the structural analysis and expression, determining the deviations from the goals and carrying out the necessary corrections, determining the directions and improvement procedures for the staff training, the reduction of the risks resulting from the maintenance and promotion of incompetent people, a better allocation of workers on the job, a fair wage, an increase in the competitive ability of the institution.

Over time, due to the need to evaluate the staff and its performance, there were developed various methods and techniques of assessment. As a result, a variety of techniques, processes, methods

or performances assessment systems is relatively high, and the dynamics of the development of these shows a rising evolution.

2. Characteristics of the professional performances assessment

The notion of performance assessment was defined by the senior specialists in the field.

Romelaer (1993, 146) considers the staff assessment as "the act by which a public officer shall conduct an formalized assessment of his subordinates" and Ivancevich and Glueck (1986, 277) considers that "performances assessment is the main activity of the human resources management, in order to determine the extent to which employees efficiently carry out their duties or responsibilities which are delegated to them".

On the same line there are the Rosca, Negulescu and Neamţu in the 'Human Resources paper. Preparation continues. Career management" in which mention that 'the performance assessment is the degree in which the employees perform their responsibilities in relation to the held position "(2005, 127).

Over time, the notion of performance assessment was developed until the much more complex definitions. Stanciu (2003, 219) and Manolescu (2004, 389) define "performances assessment as a cognitive task, action or process through which a person's performance is reported at a predetermined standard and with his mental representation, his own system of values or with his own conception regarding the obtained performance". Rosca C., Vărzaru M., and Gh. I., (2005, 202) are of the opinion that "the assessment process of the professional performances is focused on the way how the employees carry out their objectives, tasks and responsibilities and aimed at assessing the potential, skills, behaviour, performance". Popa I., (2005, 151) stresses that "the assessment involves the measurement of performances, while the control involves the comparison of the predicted results with those obtained". Rosca, Negulescu and Neamţu (2005, 129-130) mention that "performances assessment aims, in particular, the obtained results obtained, reflecting the quality of the activities."

In the paper Human Resource Management- practical guide published in 2005, Pânişoară presents to us the performances assessment as an important aspect of human resources management, because through the assessment there must be understood the dynamic nature of the professional development and also we must perceive the professional development as an ongoing process, and not as a simple event in the employee's life". The purpose of assessment is to assist in the taking of decisions that affect individuals, the decisions that should have an objective and fair foundation.

"The diversity of views related to the performances assessment of the human resources do not fit but supplement one another. Through the performances assessment there is established the level at which it was reported to a predetermined size, which means that is the basis for the design of the future decisions in this field" (Văcărescu Hobeanu 2012, 132).

3. Stages in the assessment process of the professional performances

Professional performances assessment involves a degree of formalization and planning, reflecting its importance in the context of the human resources management and includes several stages. Human resources specialist Amstrong M. (2007, 33) considers that within the performances assessment, there must be performed three stages:

- assessment planning
- preparation for the discussion of assessment;
- discussion of assessment.

These stages are represented by using the Figure 3.1. Under the planning of the performances assessment, the assessor and the assessed person meet and shall agree on four aspects:

- the job description that includes the main tasks of the employee job and within the actions in limits in which this is responsible for getting results;
- defining the objectives and standards;
- establish the requirements for knowledge and skills;
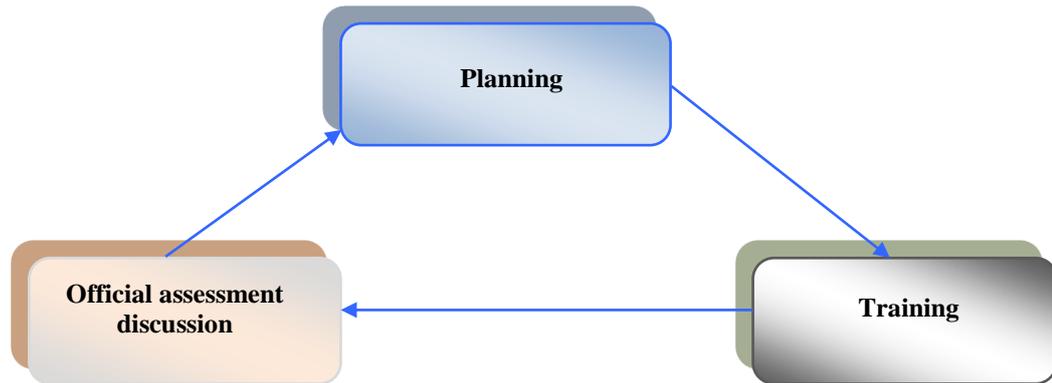- defining expectations of competence.

Figure 3.1 - The cycle of performances assessment

Source: M. Amstrong, *How you can be an even better manager*, 6th Edition, Meteor Press, 2007, page 33

The definition of the job description entails the recognition of the main areas in which they will agree on the objectives and assessment performance. The objectives and standards must be specified for each task or key results area. Furthermore, it should be noted how the achievements will be appreciated, i.e. the measurement of the performance. The knowledge and skill requirements are established following discussions with employees on the aspects that they need to know and which they can achieve in each of the main tasks fields of their positions. The discussion of assessment is the most important part of the assessment process and aims to the agreement that was reached in the planning stage, linked to the main tasks, goals and requirements, qualifications and competence.

The necessary features for the proper progress of the final meeting, which must be properly prepared, are as follows:
- support and confidence of the manager in employee, increasing the degree of openness of the meeting and of the assessment acceptance by the employee and assessors;
- an increased level of participation on the part of the employee, which increases the coefficient of satisfaction and acceptance of the assessment;
- issuance of own goals and formulating challenges to the employee, giving him the opportunity to increase the efficiency;
- open discussion of problems requires a good yield and solving these problems;
- incorporating a feedback effectively, without being considered a critique.

In preparing for the discussion of assessment, assessors and the candidates had to be documented, to prepare in advance the topics that will be discussed to devise a plan for discussion. During this phase, there must be indicated what went really well or really bad, the evidence of effective or less effective behavior, to be used in the discussion of the assessment. Assessor and the assessed person must reach a consensus about what happened, and what can be done to overcome the problems of performance.

The purpose of the discussion is that of assessment plans and identification of their agreeing, of finding the reasons why things went well or badly and what can be done in this regard. Discussion of assessment is oriented to the future, although the plan must be based on analysis of past achievements. To drive the discussion of assessment, according to Amstrong, it takes the following guidelines". (2007, 36).
- presentation of the whole period, not only to past events;
- goodwill being granted to the assessed person to speak as much as possible;
- praise of the assessed individuals where appropriate;
- validation of achievements and reinforce strengths;
- criticisms based on evidence and not opinions;
- obtaining a constructive feedback, identification of problems and their resolution;
- having a helpful attitude and not judge attitudes, generating ideas and resolve issues.

In the report drawn up by the assessor there will be pointed out the strengths and weaknesses as well as suggestions for personal development. The development plan targets two issues: improved efficiency of the employee on the held position and the preparation of staff for promotion. In addition to the development plan, the discussion must include assessment and fixing of performance objectives for the next period, which should be clear and achievable, supported by assessed.

At the end of the discussion, the assessment report shall be drawn up, based on the information obtained during the course of the discussion, which must contain: the performance feedback obtained on the current post and it gives information about the strengths and weaknesses of employees, to include the objectives of the future and the possibilities of development. The assessment of the activity, when it is done properly and objectively, constitutes a useful tool for improving the employees' performances.

4. Basic methods and techniques of professional performances assessment

The quality of determinations related to performance depends largely on the quality of the methods or systems of assessment which are different depending on the wished goal.

There are two categories of evaluative methods means: objective and subjective methods. In the category of objective methods included tests of knowledge or evidence of professional competence to assess the quality of the professional activity and results in terms of final product for the assessment skills.

The methods are based on subjective opinions, assessments of significant individuals close to the assessed person. In this category there are: scales/graphic assessment rubrics, checklists, ordering through the employees comparison the forced choice, paired comparison, through the method of forced distribution. The choice of method depends on the purpose of assessment, the importance of the approach, the available time/resources.

The diversity of methods, techniques, procedures or systems of performance assessment is great, and the dynamics of their development has seen a growing trend. The period for performance assessment is of few months until a year. The assessment shall be to the entire performance at work, either to one or more aspects of the performance.

Lefter *et al.* noted that "there is no ideal procedure, the used performances assessment, the methods and the techniques are the expression of certain factors that influence the performance assessment scheme, such as: the history and culture of the organization; the size of the organization and scope of work; strategic guidelines; practices used to the staff employment, remuneration and promotion of staff; work environment "(Lefter V, Deaconu A, Marinaş C, Puia R 2008, 248).

According to Manolescu "the necessity of staff assessment or of performances assessment in the workplace, regardless of their field of activity, led, ultimately, to the development of numerous methods and techniques for assessing the staff or to the apparition of the performances assessment systems. Thus, an attempt was made to answer, in fact, not only to some questions about why we assess or who should make the performance assessment, but also to the question: "what are the specific methods and techniques or the most appropriate performances assessment systems?" (Manolescu A. 2004, 42).

Matis, Nica and Rusu say "the quality of the determinations related to performance depends largely on the quality of the methods or systems of assessment which are different depending on the purpose, which implies:
- the validity of the results;
- fidelity of the determinations;
- equivalence of the results;
- internal homogeneity;
- the sensitivity of the used instruments (Mathis R. L., Nica P., Rusu C. 1997, 181-189).

These authors show through Table 4.1 a classification of methods of the performances assessment.

Table 4.1. Methods of assessing the professional performances according to
Matis Nica and Rusu

No.	Methods	Types
1	Methods of classification categories	The step method of classification graphics
		The method of verification
		Forced choice
2	Comparative methods	Simple comparison
		Comparison of pairs
		Forced Distribution
3	Personality tests	
4	Descriptive methods	Critical incident
		The Essay
		Assessment of a domain
5	Complex assessment methods	Assessment method based on behavior
		Management by goals
6	The transitional system of performances assessment	

Source: Matis, Nica and Rusu, *Human Resources Management*, Economic Publishing House, Bucharest, 1997, 181-189

Pitariu (1994, 43) ranked methods on performances assessment according to Table 4.2.

Table 4.2. - Assessment methods of the professional performances according to Pitariu

No.	Methods	Types
1	Scale of assessment	Scale charts
		Rating scales with multiple steps
		Standardized scale
		Scale of points
		Scale focused on behavior
2	Comparative methods of performance assessment systems (comparison of persons)	A simple comparison (ranking)
		Comparison of pairs
		Comparison through forced distribution
		The comparison between groups
3	Lists	Apparently equal interval method
		Sumative assessment method
4	Behavioral descriptions	Scale of assessment with behavioral anchors (SEAC)
		Standard rating scales mixed (SESM)

		Behavior observation scale(SOC)
		The summarized behavioral scales (SCR)
5	Other types of scales and assessment techniques	Lists of verification or control
		The assessment through forced choice
		Critical incident technique
		Lists of responsibilities
		Written essays
		Analysis of a certain field
		Tests of skill, personality or performance
		Management by goals
		Binary notation
		Zapan method of assessment of personality
		„feedback $360^{0"}$ Technique

Source: Pitariu, H., *Human resources management-Professional Performances Measurement*, 1994, page 43

Below we present the basic features of methods and a few kinds of them.

- *Assessment methods based on the assessed person' features*

The following are typical fields of activity of the human resources management: selecting candidates to employment; the choice of candidates to promote; development managers. The assessment methods that belong to this group of criteria emphasize the personal qualities of employees and not on what the individual makes or on the results that this gets. It presents the following disvantages: they are not significant for the nature of the activities, especially when they are applied to different types of posts, making it impossible to prove the validity and credibility of these and they increase the possibility of the apparition of halo effect type errors, error of central tendency, indulgence, etc. In this category of methods there are the psychometric tests and scales of notation.

- *The persons' comparison systems*

The comparison of systems people use groups of individuals who are compares with each other. The application of the method, which involves comparing the performance of each toward the other, means a rough stability of employees within the organization. It follows a hierarchy in which the employee receives the best 1st rank; the next receives the 2nd rank, etc. Although these methods are simple to understand, explain and use, they require knowledge of the performances of all the employees, this fact is difficult when there are a greater number of them. Comparison systems are classified in the following way:
- simple comparison (hierarchy) or comparison on the entire group (ranking system based on the order of merit);
- comparison based on pairs;
- comparison through forced distribution.

- *Assessment methods based on* behavior

The assessment according to the behavior is very important for improving the performances. The literature uses the term "performance factor" as a generic name for the skills, abilities, behaviors, knowledge, which are essential to achieving the desired results. The assessment methods based on behavior are:
- weighted behavior lists;
- critical incidents technique;

- scale of assessment with behavioral anchors (SEAC);
- behaviour observation scale (SOC);
- assessment through the forced choice;
- „feedback 360" technique.

   ▪ *Assessment methods based on results*

Among the most important methods of performances assessment based on results, there are the objective and management method of the list of responsibilities. The objective management method involves a system of "guided self-assessments", it is used to evaluate the performance of senior managers, it sets the goals that the employee needs to perform in a given period and the performance that the employee must achieve. To be implemented it is necessary to go through the following steps:

- issuing the organization mission and strategic plans resulting therefrom;
- setting goals for the operative main units;
- organizational objectives development-in terms of business: productivity, profitability, market segments;
- choice of objectives and realistic and encouraging performance standards for the members of the organization;
- presenting plans of action in order to achieve the set objectives;
- implementation of the action plans and making corrections if it is necessary to achieve the goals;
- a systematic check of the performance compared to the set goals and purposes;
- assessing the overall performance, the enhanced behavior and motivation, after that the cycle is taken again.

At the end of the year, each employee's performance is assessed in comparison with the success obtained by this in the fulfilment of the goals/objectives agreed at the beginning of the period, at which time the rewards are established, professional development plans, career planning, etc. The management by objectives has the following advantages: it strengthens motivation and it improves performance; it encourages creativity and innovation; it contributes to the coordination of the activities of the whole enterprise. The disadvantages are as follows: management by objectives may not be suitable for the assessment of employees; it is inconsistent with the positions with low flexibility. This method can fail due to bureaucratic and centralized nature of it, but also the emphasis on quantifiable results and not on the qualitative factors and behavioral aspects of the performance. List of responsibilities, the method consists of a sequence of requirements which are for a particular job. The assessed person is compared to every requirement, setting if this person meets the requirements which are included in the responsibilities of the job.

The great advantage of the method is the comparability of the obtained results following the assessment, due to forecasts of the same assessment criteria for all the items of the same kind. The disadvantage of the method is that of neglecting the aspects of individual items through which the same kind jobs are distinguished from each other. Each of the methods listed has its own advantages and disadvantages, but the yield of a system of assessment depends on a number of aspects that may influence decisively the final results.

5. Description of the system for the professional performances assessment

Systems of performances assessment of the staff are based on four sets of criteria, namely:

C1 – Professional competence-described with the help of Table 5.1.

C2 - Activity efficiency-presented in Table 5.2.

C3 - Professional ethics-highlighted in Table 5.3.

C4 - Managerial Skills-represented through the Table 5.4.

Table 5.1. Assessment of *professional competence* of the staff

No.	Name of under-criteria	Definition of under-criteria	Assessment level	Given mark
1	Vocational training	The amount of useful knowledge and skills Studies are appropriate	• Training is at the minimum level;	1-3
			• Training is at the medium level;	4-6
			• Training is over the job level.	7-10
2	Length of profile activity	Continuity in unity and in the business field	• 1 year	1
			• 2 years	2
			• 3 years	3
			• 4 years	4
			• 5 years	5
			• 6-7 years	6
			• 8-10 years	7
			• 11-15 years	8
			• 16-20 years	9
			• over 20 years	10
3	Creativity	The ability to produce and take new ideas	• Devoid of ideas; • The person cannot introduce the innovations in his work.	1-3
			• Little ideas; • Elaborated works, as a rule, do not contain innovations.	4-6
			• The person has new ideas, but few contain elaborated works, innovations and too little positive personality;	7-8
			• The person has new ideas in the own work, providing economic and technical solutions and shows a strong positive personality.	9-10
4	Intellect, discernment, clairvoyance	Intelligence-faculty to understand easily and well, to know; Discernment-the Faculty of judging, with clear and precise acumen; Clairvoyance-faculty to latch a fenimen in every particular, and to provide for his conduct in the future;	• The person understands hard and wrong; • The person does not assimilate new ideas; • Incapable.	1-2
			• Slow and cumbersome adjusting and partly correct adjusting in a new situation; • Not being guided the person can be reached to inaccurate conclusions;	3-4

No.	Name of under-criteria	Definition of under-criteria	Assessment level	Given mark
			• Slow, but correct adaptation; • The person tends to be mastered by routine, but this person accepts the new suggested solutions; • The person does not possess common sense precautions.	5-6
			• Normal adaptation; • The person records the correct facts, analyzes them, compare them and find good solutions; • The person possesses the common sense precautions.	7-8
			• Fast adapation; • Sharp and keen; • The person judges correctly in all situations; • Logical, correct and concise reasoning; • The person possess a sure common sense precaution.	9-10
5	Availability to the effort	The quality to undertake the additional tasks in time	• The person is not available to effort;	1-3
			• The person is available to an additional effort;	4-6
			• The person is available to an additional effort, upon request, only in certain cases;	7-8
			• The person is always available to an additional effort.	9-10
6	Extension of the activity field	Appropriation to approach the other fields than those required by the function	• The person is strictly limited to the activity field of the function/job;	1-4
			• The person has knowledge beyond the activity field of the function/job, but she does not apply it;	5-8
			• The person has knowledge beyond the activity field of the function/job, and she applies it.	9-10
7	Organizational skills	The ability to obtain the best yield from human beings and machines	• The person is not good to plan the own activities nor any activity of the subordinates; • Unable to mobilize the collaborators and to inspire trust to them;	1-2

No.	Name of under-criteria	Definition of under-criteria	Assessment level	Given mark
			• The person is generally unsociable and organizes incorrectly own activity and subordinates activity; • The person is hardly accepted by collaborators, not knowing to train them sufficiently in activity;	3-4
			• The person organizes satisfying the own activity, as well as that of the subordinates, but getting unsatisfactory results in the use of working time;	5-6
			• The person organizes the own work so well, as well as that of the subordinates; • The person knows well the available resources and ensures their proper use;	7-8
			• The person organizes very well both the own work and that of the subordinates; • The person uses the newest methods of organization.	9-10

Table 5.2. Assessment of *activity efficiency* of the staff

No.	Name of under-criteria	Definition of under-criteria	Assessment level	Given mark
1	The volume of activity	Carrying out the activity volume which is established for function	• The person does not realize the amount of work required by the function; • The person performs at limit the activity volume which is demanded by the function; • The person performs without problems the activity volume which is demanded from the function; • The person performs the activity volume which is demanded from the function , this person being also available for the other tasks.	1-3 4-6 7-8 9-10
2	The quality of the performed work	Performance of the tasks in accordance with the norms without any mistakes	• Very poor quality; • Often under the quality requirements; • The person performs at limit the quality requirements; • The person performs the good quality works; • The person performs the works of exceptional quality.	1-2 3-4 5-6 7-8 9-10

No.	Name of under-criteria	Definition of under-criteria	Assessment level	Given mark
3	Efficiency in execution of works	The person works quickly, is active	• The person delays the works, not planning the activity;	1-2
			• The person is considered slow;	3-4
			• The person is responsive to the recommendation;	5-6
			• The person performs the works in the requested time;	7-8
			• The person is operative achieving the works in the shortest time.	9-10
4	The degree of complexity of the work	The extent to which the work to be done is made up of several parts	• Reduced complexity, below the level of the function;	1-4
			• The person performs the works of medium complexity, which correspond to the function level;	5-7
			• The person performs the works of big complexity, which exceed the function level.	8-10
5	Responsibility, economic efficiency	Conscious attitude towards obligations of the fulfilled function The execution of works brings loss of savings to the company	• The achieved works do not have an economic efficiency on the company;	1-3
			• The achieved works have a reduced economic efficiency;	4-6
			• The achieved works have a medium economic efficiency;	7-8
			• The achieved works have a big economic efficiency.	9-10

Table 5.3. - The staff assessment after the *professional ethics*

No.	Name of under-criteria	Definition of under-criteria	Assessment level	Given mark
1	Consciousness, perseverance, diligence	• Consciousness -who makes seriously the debt • Diligence - skills, zeal in activity, striving, working with spore; • Perseverance – insistence, steadfastness in activity, persuasions, skills, toughness.	• Lagged, the persons neglects, abandons the work tasks;	1-2
			• Lack of interest for the activity; • The person requires oversight;	3-4
			• Working quite conscientiously;	5-6
			• Working conscientiously and well;	7-8
			• Working very conscientiously in achieving the tasks .	9-10
2	Fairness, reprimanding in dealing with people, integrity	• Fairness-flawless behaviour, fair, objective and main • Integrity-honesty, incorruptibility	• Unstable Character, incorrect, unprincipled character; • Systematically violating the rules of social conduct.	1-2
			• Honesty and limited fairness; • Interested more for the personal problems; • Incorrect in conduit.	3-4
			• Acceptable character; • Poor fairness in some situations;	5-6
			• Well-defined and stable character; • Honest, fair and genuinely conduct;	7-8

No.	Name of under-criteria	Definition of under-criteria	Assessment level	Given mark
			• Very well-defined, positive and exemplary character; • Always having correct honest and principle behaviour.	9-10
3	Spirit of cooperation, solicitude	Spirit of cooperation-collaborative attitude Goodwill-warm attitude, solicitude	• Refusing cooperation; • Being intolerant; • Causing animosity, unpleasant situations.	1-2
			• Lack of collaboration; • Heat-resistant to criticism; • Working singular; • Cumbersome integrating in collective .	3-4
			• Accepting a limited collaboration; • Acceptable collaborative Relationships; • Satisfactory Integration in collective.	5-6
			• Stable Behavior; • Generally sociable.	7-8
			• Collaborating well with staff members; • Having good relations of work; • Responding to all the requests; • Being appreciated in collective; • Establishing the positive working relations; • Being a binder of the collective.	9-10
4	Attachment for organization	Devoted attitude towards the mission and goals of the company, both inside and outside of this	• Lack of attachment; • Reduced interest in defending the company interests.	1-3 4-6
			• Defending the interests of the company, but with modest results.	7-8
			• Knowing to defend the company interests, both inside and outside of this.	9-10
5	Discipline	Punctuality Compliance with internal rules and regulations of working hours, etc. Full and effective use of working time	• Unruly, violating systematically the rules, delaying, etc.; • Often leaving the job; • Frequent deviations from the norms of work; • Specific concerns at work.	1-2
			• The person is not very punctual, delaying from the program; • Being lagged, passive.	3-4
			• Being generally disciplined; • Incidental Delays.	5-6
			• Being punctual; • Respecting the discipline; • Using correctly the work time.	7-8
			• Always being correct and disciplined including the and tense situations; • The work time is integrally used and it is also used with efficiency.	9-10

Table 5.4. - Assessment of the employees' *managerial skills*

No.	Name of under-criteria	Definition of under-criteria	Assessment level	Given mark
1	The quality of the managerial decision	• Scientific Justification • Clarity, brevity and non contradiction • Oportunity of the decision • Efficiency of the decision	• Adopting inappropriate decisions;	1-3
			• Adopting satisfactory decisions ;	4-6
			• Adopting good, fundamental, decisions;	7-8
			• Adopting very good, appropriate clear and effective decisions.	9-10
2	Determination, firmness	• Decision-the ability to make decisions quickly and thoroughly • Firmness-moral strength, continuity in judgment	• Very poor quality;	1-2
			• Often under the quality requirements;	3-4
			• The person performs at limit the quality requirements;	5-6
			• The person performs the good quality works;	7-8
			• The person performs the works of exceptional quality;	9-10
3	Written and oral expression	Ability to present clearly and accurately the problems	• Confused, erratic expression;	1-3
			• Sufficiently clear and accurate expression;	4-6
			• Clear, concise and precise in speech;	7-8
			• Expressing in the most suited form most, being clear, complete and convincing.	9-10
4	Emotional stability	Calm, self-possessed, cold blood • Weighted-tight, balanced, moderate	• Lacking self-control; • Aggressive; • Avoided by others.	1-2
			• Getting angry easily; • Impulsive, emotional; • Suspicious.	3-4
			• Enough susceptible; • Reserved; • Getting angry harder.	5-6
			• Rarely offends someone; • Difficult to disturbed; • Calm.	7-8
			• Possessing a perfect self-control; • Never complaining.	9-10
5	Tact, behaviour, civility, discretion	• Tact- sense of the extent of reaction • Behaviour -a way of being, to present and to behave • Civility-attentive, benevolent, affable behaviour • Discretion-quality to keep a secret	• Completely lack of tact; • Always deviating from the norms of behaviour.	1-2
			• The person does not have enough tact; • Being the least tidy; • Left handed behaviour.	3-4
			• Enough tact; • Enough correct and clean; • Enough polite;	5-6

No.	Name of under-criteria	Definition of under-criteria	Assessment level	Given mark
			• Having tact; • Clean; • Polite in behaviour; • Discreet.	7-8
			• Refined; • Distinguished; • Tact in bahaviour; • Total discretion; • Remarkable in any situation.	9-10
6	Persuasion	• Persuasion power • Potential for adhesion to win their own opinions when the situation requires it	• Lack of persuasion; • Improper Arguments; • Not understanding the partners.	1-3
			• Low persuasion power; • Weak arguments.	4-6
			• Good persuasion power.	7-8
			• Very good persuasion power.	9-10

The assessment criteria are the same for all categories of staff, but the analysis is performed for each position in part within the company. Every criterion is growing on many under-criteria, and each level of appreciation is determined by grades from 10 to 1. Thus, the assessor, who is often directly superior to the assessed person, but there can also be a special Commission established with the opinion of the management company, can give an expression of the mark which is attributed to the assessed person, according to each under-criterion in part. The mark given to the criterion is obtained by summation of marks assigned to the followed under- criteria. Because in the overall assessment of the performances not all the criteria have the same importance, the system decides what coefficient differentiates the positions after the features of the performed activity according to Table 5.5.

Regardless of the type of the position, the sum of these coefficients is constant and equal to 10. An employee's score shall be obtained as the sum of the products of the marks received and the corresponding weighting coefficients of the position that the employee performs, on the basis of the relationship 5.1.

$$P = \sum N \times K, \qquad\qquad (5.1)$$

where: - P represents the total number of points awarded to an employee;
- N-mark which are received by the four criteria assessment;
- K-coefficient of the weighting of the position which is employed by the assessed person

Depending on the obtained score there can be assigned marks on four levels.

Table 5.5. - The weighting coefficients of the criteria for the assessment function

No.	Types of positions	The weighting coefficients of the criteria			
		Professional Competence	Activity efficiency	Professional Ethics	Managerial skills
1	**Leadership positions** • Directors • Heads of departments/services • Heads of laboratories/offices	2,50 2,50 2,25	4,00 4,25 4,50	2,00 1,75 2,00	1,50 1,50 1,25
2	**Execution positions** • With superior training • With medium training • With medium training, which does not ask for the management skills	2,25 2,00 2,00	4,75 5,25 5,75	2,25 2,25 2,25	0,75 0,50 -

No.	Types of positions	The weighting coefficients of the criteria			
		Professional Competence	Activity efficiency	Professional Ethics	Managerial skills
3	**Workers** • Qualified • Non-Qualified	1,75 1,50	5,75 5,75	2,50 2,75	- -

These ratings are listed in Table 5.6. and are the following:

- very good-level I, which constitutes consideration for the service at discount promotion;
- well-level II, which gives the person assessed, the reasoning to be promoted with due regard for the requirements of the internship;
- satisfactory-level III, which implies that the person concerned cannot aspire to promotion;
- low-level IV, implying that the person may not be kept on the post.

Table 5.6. Level assessment score

No	Types of positions	Points number on assessment levels (marks)			
		I Level Very well	II Level Well	III Level Satisfactory	IV Level Unsatisfactory
1	**Leadership positions** • Directors • Heads of departments/services • Heads of laboratories/offices	483-600 483-600 475-590	365-482 365-482 359-474	247-364 247-364 243-358	Under 247 Under 247 Under 243
2	**Execution positions** • With superior training • With medium training • With medium training, which does not ask for the management skills	471-585 410-522 410-512	356-470 297-409 289-409	241-355 183-296 177-288	Under 241 Under 183 Under 177
3	**Workers** • Qualified • Non-Qualified	338-448 308-318	228-337 198-307	117-227 87-197	Under 117 Under 87

Conclusions

According to the speciality literature the professional performances assessment and the assessment demonstrates the formal and periodic determination of the way in which employees perform their tasks specific to the position that they occupy in relation to assessment standards, established criteria and to the used methods.

The assessment is the activity through which there can take place the motivation of employees, this assessment maintains the personal contacts, recognizes the quality work and promotes a certain image into assessed person. Performances assessment of employees of an organization can drive both to a real motivation in work of these, and to a deep demotivation and even to the resignations. Such situation may be caused by the indulgence, or the exigence in the assessment process. These errors occur when some persons who assess tend to assess the employees at a very high level or at a too low level. Therefore, there can be appeared the growth trend of the subjectivity by giving unduly the very favorable or very unfavorable marks, and this fact leads to incorrect reward. Avoiding such situations can be avoided by using multiple criteria in assessment and the criteria of several assessors.

In the present paper we have rendered the classification of methods and techniques for assessing the performances by the specialists in human resources. In the organizations there are very important the human resources and their professional performances, having integrated well organized

systems in which there are managed the assessment techniques and methods being characteristic for the concerned fields.

I mentioned that each of the described methods has its own advantages and disadvantages, but the effectiveness of an assessment system depends on various factors which may influence the decisive final results. Thus, it is necessary that all the involved elements be justified and properly applied. We cannot rule out that one method is better than another, each of these being used with more or less success, depending on the needs of the assessment.

The human resources performances assessment should not be limited only to the previous performance measurement but there must be estimated the upcoming performances. For the purpose of the employees' professional targeting it is very important the discussion between assessors and the assessed person. The assessment results generate the proposed concrete programs at local, national or European professional level for the professional development of the resources and professional opportunities. The assessment system of the performances, with the manner in which it manages its results, influences the size of the employees' rewards, their relationships with superiors, the quality of the undertaken activities undertaken, the possibilities of promotion, the overall performance of the organization.

In this regard, because of the importance of the performances assessment for obtaining the sustainable competitive advantage of the organizations, it is essential that every organization devise its own assessment system for the employees' professional performances.

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BANK-RELATED ASSET MANAGEMENT FIRM AND RISK TAKING IN MUTUAL FUND TOURNAMENT: EVIDENCE FROM ASEAN ECONOMIC COMMUNITY

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Abstract:

We examine risk-taking behavior of mutual funds in ASEAN Economic Community by applying parametric approach to determine whether it complies with the tournament hypothesis. The "winner" mutual funds tend to reduce their risk in the second half of the year to maintain their status or ranking, while the "loser" mutual funds adjust their portfolios to be riskier in the expectation of a better result by the end of the year. In the market that dominated by commercial bank-related asset management companies, we find solid evidence that the winner funds reduce their portfolio risk, while the loser funds increase their exposure. The type of asset management company affects funds' risk-taking behavior. Bank-related winner funds exhibit higher risk-taking behavior in the second half of the year compared to non-bank related funds.

Keywords: mutual funds, risk-taking, tournament behavior, bank affiliated funds.

JEL Classification: G11; G23; O16.

1. Introduction

There are two schools of thought explaining the risk taking behavior in mutual fund industry, namely the tournament behavior hypothesis and the strategic behavior hypothesis. The first theory postulates that interim loser funds are more volatile than winner funds during the second half of the year because loser funds want to be among the top performing funds by the year's end in order to earn a new investment flow (Koski and Pontiff 1999, Taylor 2003, Goriaev, Nijman, and Werker 2005, Acker and Duck 2006, Kempf and Ruenzi 2008, Kempf, Ruenzi, and Thiele 2009, Chevalier and Ellison 1995, Brown, Harlow, and Starks 1996). Alternatively, the second theory discusses from the winner funds' perspective, which they adjust their portfolio risks more than loser funds do during the second half of the year in order to either maintain or boost performance (Qiu 2003, Benson, Faff, and Nowland 2007, Hallahan, Faff, and Benson 2008, Jans and Otten 2008, and Hallahan and Faff 2009).

Nathaphan and Chunhachinda 2012 hint that asset management companies (AMCs) having relationship with commercial bank AMCs hereafter bank-related (BR) AMCs, introduce higher growth from new investment flow compared to non-bank-related (NBR) AMCs. They show that both types behave significantly different. In addition, the tournament hypotheses show that the winner funds have incentive to reduce risk to secure their position in mutual fund tournament in the second part of the year. The loser funds have incentive to take more risk to capture the higher performance in the second part of the year Therefore, in this study, we group AMCs into BR and non-bank-related (NBR) funds as prior literature. In addition, these funds possess different portfolio allocations due to different information advantages and styles (Massa and Rehman 2008 and Hao and Yan 2012). However, none of previous study focuses on the difference between the structure of AMCs and their risk taking behavior. To fill this literature gap, the different risk taking behavior between BR and NBR funds is documented by this study. We find that the structure of AMCs affects risk taking behavior of loser funds - the BR loser funds increase funds volatility higher than that of NBR loser funds.

Most of the previous researches are conducted in developed markets, but there are few reports from emerging economies. The studying of emerging markets would have important contributions since emerging markets illustrate significant growth. Also, their rapid rate of growth has led to an

increase in their share of the global market (Kearney 2012). Emerging markets differ from developed markets in many aspects. First, emerging markets have higher average sample returns and volatility than developed market. Besides, these higher returns have been found to have high serial correlation and also found to be predictable (Bekaert and Harvey 1997 and Harvey 1995). High serial correlation is the result of inefficient information by which are documented insider trading in emerging markets. Therefore, this difference raises more concern over the results found in developed countries' markets (Huij and Post 2011).

This paper investigates the risk taking behavior of mutual funds in four ASEAN Economic Community (AEC) countries, namely Indonesia, Malaysia, Singapore, and Thailand[1] over the period of 2008-2013. The overall results are consistent to tournament hypothesis. Given the a convexity relationship between new investment fund-flows and past performances shown in Chevalier and Ellison 1995, Ferreira *et al.* 2012, Sirri and Tufano 1998, we further analyze whether the structure of asset management companies (AMCs) affects its risk taking behavior of mutual funds in annual tournament setting. In sum, AMCs adjust their portfolio risks in response to a new investment fund-flow leading to more fees to AMCs.

We further improve a model to capture evidence of risk-taking behavior that has taken into account the effects of the interim performance and industry structure. The panel corrected standard error regression to reveal the behavior of the winner and the loser funds is employed. We contribute to prior literature, the development of mutual fund industry, and corporate finance as follows. First, our results demonstrate different levels of the tournament behavior in AEC markets. We find that each market possesses a unique fund flow pattern, leading to a different level of the tournament behavior. Second, tournament behavior is found in Thailand, specifically in August while other countries have less evidence of tournament behavior. We notice that the winner funds are lowering their portfolio risk in the latter part of the year. This study also provides the evidence confirming the existence of mean reversion property of fund volatility in all market. Last, the bank-related AMCs managed mutual funds expose to risk shifting comparing with NBR AMCs in BR AMCs dominated market – Thailand. Moreover, for Thailand, we find the tournament behavior in two of three assessment period but not for NBR group. Controlling for specific fund characteristics, we conclude that the tournament effect exists in the BR AMCs dominated market.

The remainder of this paper is organized as follows. Section 2 shows the review of literature and development of the hypothesis. Section 3 describes the data, methodology, and industry overview. Section 4 shows the empirical results and the last section is conclusion.

2. Literature review

2.1 Fund flow – performance relationship

Sirri and Tufano (1998) demonstrate that the positive relationship of fund flow and performance is a convex function. However, poor performing funds are not penalized by the same proportion of outflow (Chevalier and Ellison 1995 and Sirri and Tufano 1998), thus the convexity differs from market to market. Ferreira *et al.* (2012) point out that this relationship depends on the level of investors' education, the level of accessibility to information, and the development of financial markets. They also suggest that the convexity is more sensitive in less developed markets. Therefore, the relationship pushes AMCs to take more risks in order to capture future fund flow, particularly in emerging markets.

2.2 Tournament Behavior

The tournament behavior model was first developed in 1996 by Brow, Harlow and Starks (BHS). They implicitly assume that investors observe the mutual fund's year-end ranking and utilize this information for their investment allocation. Therefore, this motivates AMCs to compete for top positions in the annual tournament. In addition, they find that the asymmetric effect of convexity in fund flow performance relationship motivates poorly performed funds to increase their portfolio risk to be higher than winner funds in order to enhance their performances by the end of the year. Several

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[1] The sample data are accounted for 79.01% of AEC economic size at the end of 2012. We obtain the GDP data from ASEAN statistical yearbook.

pieces of evidence demonstrate the tournament effect in the US sample. The evidence supports the existence of tournament in that the interim loser funds increase portfolio risk to catch up the performance while the interim winner funds prefer to lock in their top position for example by indexing (Chen and Pennacchi 2009, Chevalier and Ellison 1995, Dass, Massa, and Patgiri 2008, Kempf and Ruenzi 2008, Kempf, Ruenzi, and Thiele 2009, and Schwarz 2012). Some research, however, rejects the tournament hypothesis in the US market based. Busse (2001) find the tournament exist because of biased estimation (Busse 2001). Others find support of strategic hypothesis in that the winner funds increase risk more than loser funds (Qiu 2003, Tourani-Rad, Jans, and Otten 2008).

Acker and Duck (2006) provide the first study of tournament behavior outside the US market, with the dataset containing UK investment trusts. They find evidence support tournament behavior and suggest that it has a positive relationship with market conditions. Benson *et al.* (2007) document those derivatives users behave strategically. Their result contradicts Koski and Pontiff's finding. The evidence is also inconclusive outside of the US sample, with a study of Australian superannuation funds showing strategic behavior dominated tournament behavior (Hallahan, Faff, and Benson 2008). Hallanhan and Faff (2009) find evidence of tournament behavior on sample of Australian equity funds between 1989 and 2001.

Only limited studies have been conducted in emerging areas. The prior evidence on emerging areas is neither persistent nor conclusive. For example, Ko and Ha (2011) study the Korean equity funds. Their results show that the tournament behavior is not persistent (KO and HA 2011). Ramiah *et al.* (2012) apply non-parametric test and document both tournament and strategic behavior in conventional Malaysian funds (Ramiah *et al.* 2012).

To fulfill the gap, the comparison between four largest economic in AEC, leads to a clearer result. This is because emerging market and developed market have different market characteristics. Therefore, our sample can depict the result in both emerging markets and developed market. Furthermore, as the AMCs in this region can be classified into BR and NBR (Nathaphan and Chunhachinda 2012). These BR and NBR AMCs have different investment fund flow. In addition, BR and NBR AMCs have different portfolio allocations due to the exploitation of different information. BR funds have an advantage from privileged information on clients: lending information, for example (Massa and Rehman 2008). Furthermore, BR funds are likely to hold their clients' stocks improperly (Hao and Yan 2012). As a result of improper allocation, BR funds lose portfolio diversification and have greater volatility in the second half of the year. The recent research documents the evidence showing that the investment bank managed funds have lower funds' alpha compare with non-bank managed funds. Lead to the conclusion of conflict of interest found in investment bank managed funds (Berzins, Liu, and Trzcinka 2013). Finally, the high return and high volatile characteristics of emerging markets demonstrate the importance of diversified portfolios and the influence of risk-taking behavior by mutual funds.

We propose to test the tournament effect in the emerging market context through the hypotheses below;

H1: There is a relationship between the interim performance and the risk adjustment of funds.

H2A: There is a negative relationship between the interim performance and the risk adjustment of winner funds.

H2B: There is a positive relationship between the interim performance and the risk adjustment of loser funds.

H3: BR and NBR funds have different effects on risk-taking behavior due to their interim performance.

3. Data and methodology

In this study, we obtain data from various sources. Data on monthly asset under management (AUM), net asset value (NAV), total return, net flow, annual reported net expense ratio, and turnover ratio are obtained from Morningstar Direct database. The risk-free rate and market return are obtained from DataStream.

In order to compare the data in different countries in a meaningful perspective, the investment objective will be classified into category according to the Morningstar Global Broad Category Group. The initial samples under this study are 1,059 equity open-ended funds. However, we limit sample to domestic equity open-ended fund type. Fund of fund, feeder fund, index fund, money-market fund and other international fund types are excluded from our sample. We also excluded sector funds from three markets - Malaysia, Indonesia, and Thailand. For Singapore, the majority of domestic funds are sector funds. Therefore, the results from two different type of fund can depict the different picture between flexible and restricted funds. Besides, according to Ramiah *et al.* (2012), the Islamic funds make investment decision under Shariah law and thus no evidence of tournament in this type of fund. Therefore, we excluded the Islamic type of fund from our sample. Commercial bank definition and list of commercial bank are obtained from BankScope. In BankScope, it specifies a bank specialization as commercial bank. We manually match the banks' name and AMCs' name. Besides, we use information on each fund website to cross check the relationship with bank.

Finally, our samples consist of all domestic equity open-end mutual funds in four countries, namely Indonesia, Malaysia, Singapore and Thailand. The total number of observation is 4,338 fund-year-observations which consist of 836 funds by the end of 2013. This represents about 79% of our initial sample.

Table 7- Sample descriptive statistics of fund by country.

Country	Number of Fund			AUM	$\overline{AUM}$	Age (yrs)	$\overline{Ret}$	$\overline{std}$	Entry Fee	Exit Fee	Mng. Fee
	Total	BR	NBR								
Indonesia	97	21	76	82.64	1.54	5.16	1.1542	6.79%	1.8726	1.0455	2.4932
Malaysia	89	43	46	76.15	0.51	11.47	1.0943	3.22%	5.3132	2.4000	1.4879
Singapore	59	13	29	41.26	1.01	7.07	1.0251	4.52%	4.4727	0.9474	1.3845
Thailand	215	150	65	55.36	0.16	8.58	1.1585	5.99%	0.8984	0.6859	1.4091

Note: The table reports Number of fund, AUM (million USD) and $\overline{AUM}$ at the end of 2013. Fund Age, Average fund return, Average fund standard deviation, Entry Fee, Exit Fee and Management Fee are the time-series average of yearly cross-sectional between 2008 and 2013.

Table1 shows the sample descriptive statistic by country. By the end of 2013, Indonesia has the largest number equity mutual funds followed by Singapore, Malaysia, and Thailand, respectively. Among these four countries, Thailand has the largest number of equity open-end funds of 215 by the end of 2013 while Singapore has the lowest number of funds in the same category, 59 funds. Malaysian funds have the longest average fund age which almost twice of Indonesian funds. Among AEC countries, Thai funds shows top performance followed by Indonesian, Malaysian and Singapore respectively. For fund volatility, Indonesian and Thailand have 6.7% and 5.99% of standard deviation, which reflects the characteristic of emerging markets environment. Malaysian funds display the lower fund volatility. Moreover, Malaysian funds have higher entry and exit fee. This shows that the Malaysian funds have the highest switching cost among our samples. Indonesian funds are found to have the highest average management fee at 2.5% per annum while the others have approximately 1.4% per annum.

Mutual funds can be grouped into BR and NBR. Thailand is the only country in our samples that BR funds dominated NBR funds. From table2, Thailand, Singapore, and Indonesia are the markets that the mature funds have stayed in the top performance portfolio while Malaysian fund out-perform by younger fund. NBR funds are older than BR fund in Thailand, Singapore, and Malaysia. Only for Indonesian market that BR funds are older than NBR.

3.1 Fund flow – performance relationship

Fund flows are defined as the total new asset of fund excess that of reinvestment rate. Therefore, we follow the calculating fund flows method suggested by of Sirri and Tufuno (1998), Chevalier and Ellision (1995) and Ferreira *et al.* (2012).

$$FLOW_{i,t} = \frac{AUM_{i,t} - AUM_{i,t-1}*(1+R_{i,t})}{AUM_{i,t-1}} \tag{1}$$

$FLOW_{i,t}$ is the end period new asset flow to the fund, while $AUM_{i,t}$ is the AUM in the end of t period and $AUM_{i,t-1}$ is AUM at the end of *t-1* period. $R_{i,t}$ is the fund return of period t.
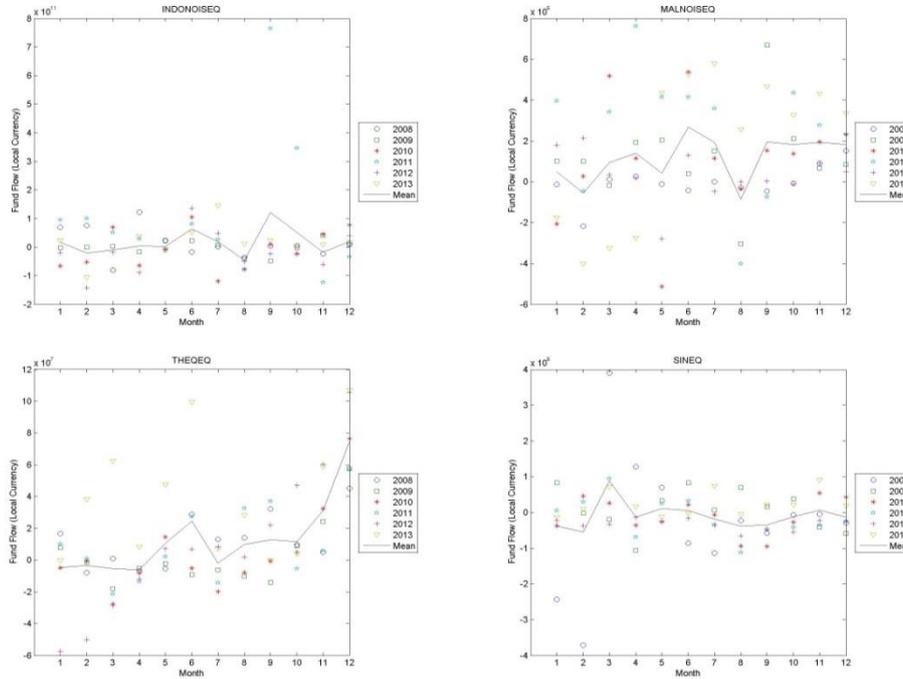

Figure 1 - Average Monthly fund flow during 2008-2013

Figure1 displays that funds in Indonesia, Malaysia and Thailand have positive in flow in last quarter of the year while those in Singapore do not have fund flow fluctuation. Analysis of Thailand clearly depicts the positive fund flows in the last quarter of the year because of tax-incentive (Nathaphan and Chunhachinda 2012).

Table 8 - Interim performance portfolio.

Country	AGE(year)			AUM(local currency)			Total Return			Standard Deviation			Entry Fee			Exit Fee			Management Fee		
	Full	BR	NBR	Full	BR	NBR	Full	BR	NBR	Full	BR	NBR	Full	BR	NBR	Full	BR	NBR	Full	BR	NBR
INDO																					
Port1	3.77	4.53	3.53	3.49×10^{11}	1.73×10^{11}	3.98×10^{11}	0.74	0.79	0.72	4.81%	5.23%	4.70%	1.22	0.91	1.35	0.12	0.00	0.14	1.57	1.74	1.54
Port2	5.27	5.73	5.26	9.68×10^{11}	1.03×10^{12}	1.05×10^{12}	0.81	0.87	0.80	4.57%	5.11%	4.48%	1.01	1.05	1.00	0.49	0.00	0.55	1.57	1.63	1.57
Port3	4.26	5.19	3.92	7.24×10^{11}	6.26×10^{11}	6.52×10^{11}	0.89	0.96	0.86	4.87%	5.21%	4.68%	1.10	1.10	1.07	0.79	0.00	0.82	1.70	1.73	1.65
MAL																					
Port1	13.13	11.36	14.89	1.39×10^{8}	2.85×10^{8}	4.06×10^{7}	0.98	1.00	0.97	3.35%	3.26%	3.38%	5.21	5.38	5.13	1.48	0.00	1.78	1.46	1.44	1.47
Port2	11.20	11.22	11.08	1.67×10^{8}	2.39×10^{8}	4.51×10^{7}	1.07	1.03	1.02	3.30%	3.24%	3.11%	5.34	5.01	5.15	0.42	0.00	0.46	1.45	1.36	1.43
Port3	10.01	9.22	9.31	1.37×10^{8}	2.28×10^{8}	5.37×10^{7}	1.15	1.08	1.15	3.62%	3.56%	3.53%	5.20	5.02	5.11	2.31	0.00	2.46	1.47	1.37	1.49
SIN																					
Port1	5.45	5.01	5.66	4.77×10^{7}	3.35×10^{7}	5.09×10^{7}	0.79	0.69	0.84	4.91%	4.45%	5.17%	0.63	0.67	0.52	1.21	1.20	1.18	1.42	1.28	1.51
Port2	5.30	4.62	5.76	5.56×10^{7}	3.24×10^{7}	6.69×10^{7}	0.90	0.79	0.96	4.36%	3.84%	4.58%	0.53	0.46	0.50	1.17	1.16	1.14	1.41	1.29	1.45
Port3	6.19	5.25	6.69	5.16×10^{7}	3.15×10^{7}	6.26×10^{7}	1.04	0.92	1.09	4.33%	3.91%	4.49%	0.55	0.54	0.53	1.17	1.16	1.15	1.42	1.24	1.50
TH																					
Port1	7.52	7.17	7.55	1.33×10^{9}	1.59×10^{9}	4.64×10^{8}	0.95	0.92	1.04	5.49%	5.25%	6.07%	0.83	0.73	0.92	0.55	0.46	0.68	1.34	1.38	1.20
Port2	8.62	8.55	10.17	8.34×10^{8}	1.02×10^{9}	5.81×10^{8}	1.03	1.00	1.07	5.35%	5.21%	5.50%	0.88	0.86	1.13	0.59	0.49	0.87	1.27	1.31	1.21
Port3	7.91	7.57	8.04	7.77×10^{8}	9.97×10^{8}	4.22×10^{8}	1.10	1.08	1.14	5.46%	5.42%	5.66%	0.70	0.62	0.83	0.58	0.53	0.70	1.20	1.27	1.08

Note: The interim performance on first 7 month (7,5) use to form the portfolio in each annual tournament. Portfolio1 represent the bottom one-third of sample, Portfolio3 represent the top one-third of sample while portfolio2 are the middle performance funds. AMC are classified into Bank-related (BR) and Non-Bank-related(NBR) AGE, AUM, Ret, Std represent the time-series yearly cross-sectional average of each portfolio.

3.2 Empirical model

To expand the results of tournament behavior, a panel corrected standard error technique analysis is applied. As discussed by BSH, fund managers revise their investment strategies after the information in second quarter are revealed. We allow the ranking period to vary between July and September. This means we allow funds to fully observe the industry's interim performance and allow time to reallocate their investment strategies based on the interim ranking information. Extending the assessment on these three periods may detect different behavior of tournament.

$$Ret_{iMy} = [(1 + r_{i1y})(1 + r_{i2y}) \dots (1 + r_{iMy})] - 1 \qquad (2)$$

Ret_{iMy} is the interim return on fund during first M month of fund i[th] in year y. r_{iMy} is the total return of fund i[th] on month M of year y. If tournament behavior exists, loser funds will increase their risk more than winner funds in the second half of the year.

$$\frac{\sigma_{L2}}{\sigma_{L1}} > \frac{\sigma_{w2}}{\sigma_{w1}} \qquad (3)$$

To further analyze the relationship between structure of AMCs and risk taking behavior, we follow prior literature and introduce DB_i as bivariate dummy variable for BR and NBR funds to the equation (Kempf and Ruenzi 2008, Kempf, Ruenzi, and Thiele 2009). DB_i is equal to "1" for BR fund and "0" otherwise.

$$\Delta\sigma_{it} = \sigma_{it}^2 - \sigma_{it}^1 = \alpha_{it} + \beta_2 Ret_{it} + \beta_3 DB_i + \beta_4 \Delta\sigma_{it}^m + \beta_5 \sigma_{it}^1 + \beta_6 lnAge_{it} + \beta_7 lnAUM_{it} + \varepsilon_{it} \qquad (4)$$

To analyze the risk-taking behavior of winner and loser funds, we divide samples into three equal portfolios – winner, middle, and loser. We first rank interim performance by percentile and then allocate to three equal portfolio, namely portfolio1 (loser), portfolio2, and portfolio3 (winner). The endogenous variable in our model ($\Delta\sigma_{it}$) is the difference between the volatility in first and second half of year for fund i[th]. The interest exogenous variables are Ret_{it} and DB_i. Ret_{it} is fund return in each period. According to the tournament hypothesis, the loser portfolios are expected to increase risk due to interim performance and hence β_2 for losers are expected to be positive. Winners are expected to reduce risk and thus β_2 expect to be negative.

Table 3 - Parametric approach using equation

	INDO			MAL			SIN			THAI		
PERIOD (7,5)												
	Port1	Port2	Port3	Port1	Port2	Port3	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
$\beta_2 Ret_{it}$	0.0000	0.00656***	-0.0076	0.0000	-0.0014	-0.0015	0.000309***	-0.00948**	-0.01	0.000654***	0.0005	-0.0007
	(0.12)	(0.00)	(0.59)	(0.32)	(0.20)	(0.15)	(0.01)	(0.03)	(0.12)	(0.00)	(0.58)	(0.45)
$\beta_3 DB_i$	0.0006	-0.0016	-0.0082	0.0001	0.0017	0.0013	0.0046	0.0034	0.0042	0.0014	0.00545***	0.00314***
	(0.89)	(0.78)	(0.26)	(0.95)	(0.31)	(0.50)	(0.38)	(0.46)	(0.59)	(0.44)	(0.00)	(0.00)
$\beta_4 \Delta\sigma_{it}^m$	0.694***	1.058***	1.317***	0.779***	0.871***	0.899***	0.501***	0.715**	1.144***	1.035***	1.149***	1.110***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\beta_5 \sigma_{it}^1$	-0.592***	-0.531***	0.3490	-0.575***	-0.297***	-0.411***	-0.563***	-0.0091	-0.476**	-0.476***	-0.529***	-0.437***
	(0.00)	(0.00)	(0.73)	(0.00)	(0.00)	(0.00)	(0.00)	(0.96)	(0.01)	(0.00)	(0.00)	(0.00)
$\beta_6 lnAge_{it}$	0.00234*	0.003	0.004	0.00256**	-0.00363**	-0.00291*	-0.003	-0.001	0.002	-0.001	-0.00519***	-0.00374***
	(0.07)	(0.17)	(0.59)	(0.01)	(0.01)	(0.06)	(0.14)	(0.74)	(0.56)	(0.27)	(0.00)	(0.00)
$\beta_7 lnTNA_{it}$	0.0005	-0.0001	0.0016	-0.0002	0.0004	-0.0011	0.0000	-0.0024	0.0035	-0.0006	-0.0007	0.0006
	(0.32)	(0.89)	(0.48)	(0.76)	(0.54)	(0.11)	(1.00)	(0.14)	(0.29)	(0.16)	(0.15)	(0.19)
α_{it}	0.0192	0.0492***	-0.0883*	0.0160	0.0017	0.0294**	0.0294**	-0.0135	0.0052	0.0472***	0.0560***	0.0173
	(0.16)	(0.00)	(0.10)	(0.13)	(0.92)	(0.02)	(0.04)	(0.76)	(0.91)	(0.00)	(0.00)	(0.16)
N	43	44	36	167	165	160	46	40	38	356	353	365
R-sq	0.898	0.897	0.312	0.819	0.834	0.87	0.751	0.756	0.787	0.863	0.915	0.934
PERIOD (8,4)												
	Port1	Port2	Port3	Port1	Port2	Port3	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
$\beta_2 Ret_{it}$	0.0001	0.0021	-0.0085	-0.0001	-0.00406***	-0.00390***	0.000550**	0.0080	-0.0107	0.000933***	0.0005	-0.00204**
	(0.34)	(0.34)	(0.23)	(0.58)	(0.00)	(0.00)	(0.02)	(0.23)	(0.21)	(0.00)	(0.52)	(0.01)
$\beta_3 DB_i$	0.0101	0.0013	0.0027	0.0011	-0.0007	0.0000	0.0009	-0.0040	0.0126	0.0004	0.00396***	0.00232**
	(0.14)	(0.75)	(0.68)	(0.56)	(0.66)	(0.99)	(0.88)	(0.42)	(0.24)	(0.84)	(0.00)	(0.05)
$\beta_4 \Delta\sigma_{it}^m$	0.930***	0.968***	0.864*	0.867***	0.821***	0.831***	0.421***	1.011***	1.334***	1.067***	1.082***	1.108***
	(0.00)	(0.00)	(0.07)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\beta_5 \sigma_{it}^1$	-0.337***	-0.283***	0.9360	-0.415***	-0.239***	-0.342***	-0.560***	-0.594***	-0.3950	-0.291***	-0.285***	-0.560***
	(0.00)	(0.01)	(0.35)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.13)	(0.00)	(0.00)	(0.00)
$\beta_6 lnAge_{it}$	0.00402**	0.0032	0.0027	0.0017	-0.00351**	-0.00492***	-0.0033	-0.00532*	0.0061	0.0010	-0.0007	-0.00252**

	(0.01)	(0.32)	(0.62)	(0.14)	(0.05)	(0.00)	(0.24)	(0.09)	(0.18)	(0.47)	(0.55)	(0.01)
$\beta_7 lnTNA_{it}$	0.0004	0.0002	-0.0017	0.0003	0.0001	-0.0010	0.0020	-0.0001	0.0041	-0.0002	0.0002	0.0005
α_{it}	(0.45)	(0.84)	(0.50)	(0.66)	(0.89)	(0.22)	(0.12)	(0.94)	(0.39)	(0.70)	(0.72)	(0.30)
α_{it}	0.0020	0.0114	-0.0329	0.0033	-0.0131	0.0168	-0.0018	0.0815*	-0.0184	0.0260**	0.0132	0.0177
	(0.92)	(0.63)	(0.53)	(0.78)	(0.35)	(0.27)	(0.94)	(0.08)	(0.77)	(0.01)	(0.22)	(0.12)
N	41	46	36	171	163	158	44	40	40	356	353	365
R-sq	0.883	0.784	0.281	0.79	0.857	0.832	0.517	0.738	0.621	0.9	0.914	0.938
PERIOD (9,3)												
	INDO			MAL			SIN			THAI		
	Port1	Port2	Port3	Port1	Port2	Port3	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
$\beta_2 Ret_{it}$	0.0002	-0.0061	-0.00790**	0.0000	-0.0006	-0.00583***	0.000911***	-0.0006	-0.0026	0.0005	-0.00252***	-0.00281***
	(0.66)	(0.44)	(0.02)	(0.23)	(0.65)	(0.00)	(0.01)	(0.90)	(0.77)	(0.39)	(0.00)	(0.00)
$\beta_3 DB_i$	0.0047	-0.0020	0.0003	0.0006	0.0010	0.0001	0.0031	-0.0014	0.0009	-0.0008	0.00338*	0.00343***
	(0.28)	(0.69)	(0.92)	(0.79)	(0.54)	(0.97)	(0.56)	(0.74)	(0.92)	(0.66)	(0.05)	(0.01)
$\beta_4 \Delta\sigma_{it}^m$	0.792***	1.060***	1.280***	0.798***	1.075***	0.725***	0.593***	0.898***	1.248***	1.003***	1.000***	1.012***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\beta_5 \sigma_{it}^1$	-0.407***	0.4720	-0.3380	-0.420***	-0.0562	-0.425***	-0.539***	-0.2250	-0.2880	-0.201***	-0.0808	-0.215***
	(0.00)	(0.29)	(0.15)	(0.00)	(0.51)	(0.00)	(0.00)	(0.28)	(0.29)	(0.00)	(0.29)	(0.00)
$\beta_6 lnAge_{it}$	0.0022	-0.0024	-0.0026	0.00186*	-0.0030	-0.00711***	-0.0052	-0.0025	0.00554*	-0.0007	-0.0006	-0.00416***
	(0.27)	(0.68)	(0.28)	(0.09)	(0.10)	(0.00)	(0.11)	(0.50)	(0.10)	(0.58)	(0.69)	(0.00)
$\beta_7 lnTNA_{it}$	0.0007	-0.0005	0.0010	0.0004	0.0004	0.0003	0.0004	0.0010	-0.0033	0.0000	0.0009	0.000953*
	(0.26)	(0.67)	(0.47)	(0.63)	(0.48)	(0.76)	(0.79)	(0.52)	(0.38)	(0.95)	(0.13)	(0.06)
α_{it}	-0.0006	-0.0233	-0.0202	0.0021	-0.0001	-0.0067	0.0317	-0.0102	0.0762	0.0189**	-0.0202	-0.0066
	(0.98)	(0.74)	(0.46)	(0.89)	(0.99)	(0.71)	(0.22)	(0.83)	(0.15)	(0.05)	(0.12)	(0.57)
N	44	45	34	168	163	161	49	34	41	357	353	364
R-sq	0.786	0.557	0.635	0.751	0.868	0.793	0.559	0.748	0.65	0.935	0.946	0.957

Note: Equation (4) $= \Delta\sigma_{it} = \sigma_{it}^2 - \sigma_{it}^1 = \alpha_{it} + \beta_2 Ret_{it} + \beta_3 DB_i + \beta_4 \Delta\sigma_{it}^m + \beta_5 \sigma_{it}^1 + \beta_6 lnAge_{it} + \beta_7 lnAUM_{it} + \varepsilon_{it}$ $\Delta\sigma_{it}$ is the difference between the volatility in first and second halves of year for fund ith. The interest exogenous variables are Ret_{it}, interim return in each periodand DB_i, bivariate dummy variable for bank and non-bank related funds. DB_i is equal to "1" for BR fund and "0" otherwise. $\Delta\sigma_{it}^m$, the median of industry standard error change. σ_{it}^1 is fund interim volatility. Age is fund Age in log form. The p-values are report in parenthesis. *, **, and *** represent significant levels, at 10%, 5%, and 1% respectively. Panel A, B and C represent the different interim period from July to September respectively

.

The control variable includes $\Delta\sigma_{it}^{m}$, the median change of industry volatility to control the segment volatility change. The funds' volatility is expected to have mean reversion. Therefore, σ_{it}^{1} is introduced to control the mean reversion of volatility (Kempf and Ruenzi 2008, Kempf, Ruenzi, and Thiele 2009). Age and AUM are introduced as the log form. The younger the fund, the less the tracking record stand. Hence, the young fund was likely to take more risk. (Chevalier and Ellison 1995, Ferreira *et al.* 2012, Huang, Sialm, and Zhang 2011)

4. Empirical result

In Table 3, we apply panel corrected standard error regression to analyze the model. To fully reveal behaviors of the funds, we perform the regression using three assessment periods. The result from table4 show the regression result from equation (4).

In panel A, we find less evidence of tournament. We cannot reject H2A for all countries. All winner fund's portfolio have negatively insignificant coefficients. However, we can reject the H2B for Singapore and Thailand. This shows that the loser funds in both countries participate in risk taking behavior to boost their performance. β_3 is positively significant only for Thailand, BR AMCs dominated market.

In Panel B, we can reject all hypotheses in Thai market. This is a strong evidence of tournament behavior in Thai market, particularly in August. The coefficients of loser funds are strongly positively significant ($\beta_{2,1} > 0.000933$) and those of winner portfolios are strongly negatively significant ($\beta_{2,3} > -0.00204$) at 1% and 5% level respectively. Besides, the coefficient of $\beta_{3.3}$ for Thai market are positive and significantly different from zero at 1% level. Singapore funds show the evidence that the loser funds increase portfolio risk ($\beta_{2,1} = 0.000550$) in latter part of the year. Although we found negative sign preserved for winner funds, we cannot reject the null hypothesis that $\beta_{2,3}$ was significantly different from zero in this market. For Malaysian funds, we find that winner funds lower their portfolio volatility but not loser funds as in the previous research. Nonetheless, Indonesia funds have no relationship in this interim period.

In Panel C, we can reject the null hypothesis H2A as we find that winner funds in every country lower their portfolio risk in second part of the year. We can reject the null hypothesis H2A for winner funds in three countries—Indonesia, Malaysia, and Thailand. Although we cannot reject this null hypothesis for Singapore, the negative sign of $\beta_{2,3}$ does preserve. Moreover, the result for Thailand hold as previous results for $\beta_{3.3}$.

We can reject the H3 for Thai market. Although $\beta_{2,3}$ preserves with negative sign, we cannot reject the null hypothesis H2A for all countries in this interim period. $\beta_{3.2}$ and $\beta_{3.3}$ are found to be strongly and positively significant for winner funds in Thai market. β_4, the segment industry change, is positively significant as expected, as well as β_5, the first part of the year volatility, that captures the mean reversion of volatility is found to be negatively significant. β_6 is found to be insignificant for all markets in our sample.

The result from Table3 provides the strong evidence of risk shifting behavior of BR AMCs in Thai market. Therefore, we further analyst the tournament effect in Thailand. We separate mutual fund sample in Thai market into BR and NBR to study the difference between them.

Table4 shows that in July and August period of sample from Thai market, in Panel A, there is the evidence of tournament behavior that can reject H2A and H2B for funds in both groups. We find that $\beta_{2,1}$ is positively significant, while $\beta_{2,3}$ is negatively and significant. In Panel B, we also reject the null hypothesis H2A and H2B for BR AMCs group, but not for NBR group. This evidence supports the tournament behavior existing in Thai market especially in BR AMCs group. Furthermore, we can reject H2B for NBR AMCs. This means that the loser fund in NBR AMCs also shift risk in latter part of the year to stimulate their fund position. Although we cannot reject H2A for winner funds in NBR AMCs, the negative sign of $\beta_{2,3}$ is preserved. In Panel C, we can reject H2A but we cannot reject H2B in both groups. This means that winner funds in both groups lower portfolios risk to secure the year end position.

Table 4 Risk shifting behavior between BR and NBR AMCs.

	Period (7,5)					
	BR			NBR		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
$\beta_2 Ret_{it}$	0.000837***	-0.000351	-0.00235*	0.000569*	0.00240*	-0.00282*
	(0.00)	(0.79)	(0.06)	(0.06)	(0.09)	(0.07)
$\beta_4 \Delta\sigma_{it}^m$	1.020***	1.130***	1.087***	1.092***	1.197***	1.161***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\beta_5 \sigma_{it}^1$	-0.529***	-0.517***	-0.483***	-0.437***	-0.594***	-0.312***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\beta_6 lnAge_{it}$	-0.000133	-0.00603***	-0.00426***	-0.00551	-0.00367***	-0.00295*
	(0.91)	(0.01)	(0.00)	(0.18)	(0.01)	(0.07)
$\beta_2 lnTNA_{it}$	-0.000863**	-0.00102	-0.000982**	-0.000236	-0.0000409	-0.000111
	(0.04)	(0.12)	(0.03)	(0.83)	(0.95)	(0.91)
α_{it}	0.0550***	0.0645***	0.00999	0.0424**	0.0544***	0.0366
	(0.00)	(0.00)	(0.48)	(0.03)	(0.00)	(0.11)
N	254	224	239	102	129	126
R-sq	0.889	0.905	0.938	0.825	0.936	0.935
	Period (8,4)					
	BR			NBR		
_	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
$\beta_2 Ret_{it}$	0.000793***	0.00167*	-0.00223**	0.00180*	-0.00109	-0.00114
	(0.00)	(0.09)	(0.04)	(0.09)	(0.43)	(0.32)
$\beta_4 \Delta\sigma_{it}^m$	1.044***	1.138***	1.145***	1.127***	1.012***	1.057***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\beta_5 \sigma_{it}^1$	-0.294***	-0.320***	-0.669***	-0.313**	-0.286***	-0.362***
	(0.00)	(0.00)	(0.00)	(0.03)	(0.00)	(0.00)
$\beta_6 lnAge_{it}$	0.00183*	0.00187	-0.00433***	-0.00217	-0.00470***	-0.000166
	(0.10)	(0.21)	(0.00)	(0.62)	(0.01)	(0.93)
$\beta_2 lnTNA_{it}$	-0.000444	0.000914	0.000538	0.000319	-0.000929	0.000976
	(0.25)	(0.12)	(0.27)	(0.84)	(0.22)	(0.27)
α_{it}	0.0294***	0.00351	0.0285**	0.0273	0.0356*	-0.00483
	(0.00)	(0.79)	(0.03)	(0.36)	(0.06)	(0.81)
N	250	218	249	106	135	116
R-sq	0.924	0.924	0.94	0.862	0.903	0.942
	Period (9,3)					
	BR			NBR		
_	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
$\beta_2 Ret_{it}$	0.000689	-0.00202**	-0.00313***	-0.000368	-0.00369*	-0.00152**
	(0.21)	(0.02)	(0.00)	(0.77)	(0.07)	(0.03)
$\beta_4 \Delta\sigma_{it}^m$	0.999***	1.034***	1.046***	1.025***	0.955***	0.935***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\beta_5 \sigma_{it}^1$	-0.295***	-0.0472	-0.304***	0.0706	-0.113	0.0295

	(0.00)	(0.55)	(0.00)	(0.50)	(0.46)	(0.63)
$\beta_6 lnAge_{it}$	-0.000561	0.00217	-0.00334**	0.00183	-0.00344	-0.00590***
	(0.69)	(0.30)	(0.02)	(0.53)	(0.13)	(0.00)
$\beta_2 lnTNA_{it}$	0.000226	0.00136**	0.00144**	-0.00160*	0.00021	0.000867
	(0.65)	(0.03)	(0.03)	(0.09)	(0.82)	(0.23)
α_{it}	0.0190*	-0.0330**	-0.01	0.0251	-0.00396	-0.013
	(0.09)	(0.05)	(0.52)	(0.19)	(0.85)	(0.39)
N	261	223	233	96	130	131
R-sq	0.936	0.952	0.953	0.943	0.94	0.975

Note: The parametric approach using equation (6) .

$$\Delta\sigma_{it} = \sigma_{it}^2 - \sigma_{it}^1 = \alpha_{it} + \beta_2 Ret_{it} + \beta_3 DB_i + \beta_4 \Delta\sigma_{it}^m + \beta_5 \sigma_{it}^1 + \beta_6 lnAge_{it} + \varepsilon_{it}$$ $\Delta\sigma_{it}$ is the difference between the volatility in first and second halves of year for fund i[th]. The interest exogenous variables were Ret_{it}, interim return. was in each periodand DB_i was, bivariate dummy variable for bank and non-bank related funds. DB_i is equal to "1" for BR fund and "0" otherwise. $\Delta\sigma_{it}^m$, the median of industry standard error change. σ_{it}^1 is fund interim volatility. Age is fund Age in log form. The p-values are report in parenthesis. *, **, and *** represent significant levels, at 10%, 5%, and 1% respectively. Panel A, B and C represent the different interim period from July to September respectively.

Conclusion

After the original paper about tournament behavior by BHS (1996), later studies document that winner (the loser) funds reduce (increase) their portfolio risk in the second half of the year. Contradictory results have also been documented, which gave rise to the alternative explanation of strategic behavior, whereby winner funds see an opportunity to increase their risk exposure in the second half of the year. Most of those previous studies, however, are conducted in developed markets.

In this study, we compare the tournament effect using parametric methods. Our results show different level of tournament behavior in AEC market. We find that four markets in AEC have different fund flow pattern leading to different level of tournament behavior. Second, we find strong evidence of tournament behavior in Thai mutual fund industry in August interim period. While, other countries show less evidence of tournament behavior. However, we found that the winner funds lower their portfolio risk in latter part of the year. Besides, our results provide the evidence confirming the mean reversion property of fund volatility that exists in all markets. Last, we show that the risk-taking behavior of BR and NRB AMCs is different. The BR AMCs managed mutual funds expose to risk shifting comparing with NBR AMCs in BR AMCs dominated market – Thailand. Moreover, for Thailand, we find the tournament behavior in two of three assessment period but not for NBR group. Controlling for specific fund characteristics, we conclude that the tournament effect exists in the BR AMCs dominated market.

Therefore, the higher risk of BR AMCs is the issue related to the conflict of interest between investors and BR AMCs in that they try to maximize benefit from fund-flow convexity. A possible explanation is portfolio allocation of BR AMCs is driven by information advantage and they also allocate strictly with such information. As a result, loss the diversification benefit as suggested by (Massa and Rehman 2008 and Hao and Yan 2012). The more recent research also confirm such conflict of interest found among investment banking managed funds. Therefore, our results fill the gap of finding among commercial bank AMCs lead to higher risk taking.

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NOWCASTING CREDIT DEMAND IN TURKEY WITH GOOGLE TRENDS DATA[*]

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Abstract:

Age of Big Data and internet has brought variety of opportunities for social researchers on identifying on-going social trends instantly. As internet user base grew exponentially, major internet content search companies have begun to offer data mining products which could extract attitude of on-going trends and identify new trends on web as well. Since 2009, as a pioneer on these web analytics solutions Google has launched Google Trends service, which enables to researchers to examine change of trend on specific keywords. We use weekly Google Trends Index of "General Purpose Loan" (GT) and total out-standing volume of Turkish banking system from the data period of first week of March 2011 to second week of September 2014. In this paper we test whether the Google Analytics search index series can be used as a consistent forecaster of national general purpose loan (GPL) demand in Turkey. We show how to use search engine data to forecast Turkish GPL demand. The results show that Google search query data is successful at nowcasting GPL demand.

Keywords: Nowcasting web analytics, forecasting, general purpose loan.

JEL classification: C53

1. Introduction

Public and private data providers periodically release indicators on level of economic and financial activities for various sectors. However, due to difficulties in data collection and statistical calculation procedures, announcement of figures could be lagged for a period of time. In addition to this, data such as GDP or IP are subsequently revised due to post publication collection of updated observations. Unless short-dated delays up to three months are tolerable for economic policy and trend analysis, on marketing strategy decisions and monetary interventions of central banks side, these delays could cause very serious short-comings in decision making processes. So, it became a common practice for researchers to forecast current conditions when the real data is delayed. This process, the forecasting of present time could be referred as now casting which is a contraction of now and forecasting.

(Hendry *et al.* 2013) defines now-casting as "any procedure that uses additional information when producing contemptuous aggregate data, beyond just cumulating observed disaggregates as now-casting". Beside that definition, (Banbura *et al.* 2010) generalizes time interval of forecasts and defines "now" as near future, now and near past. Originally as a procedure generally used by meteorologist, 'the now casting' could be defined as predicting today's or near future's weather conditions, based on extensive past meteorology data. But considering economics side, it's a fact that quality of recent data is more suspicious compared to definite meteorology data. For example GDP or IP indices employed as consistent estimators, could be updated after initial publication of data.

However, the idea made now-casting important was spill over of monetary economics and government's tendency to react spontaneous actions on any disequilibrium occurred in market environment. As stated in (Evans 2005) although, individual customers or firms are aware of their contemptuous activities, information about current state of economic activity is widely dispersed among economic agents. So this phenomenon causes disintegration between economic reality and already published data, thus markets and trading environment falls short on information on current state of economics. For example, as a major indicator of progress in economic activity the GDP indices are the most vulnerable data releases to this adverse effect.

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Accordingly, when we examine recent works on now-casting dominance of analysis on GDP growth draws attention. While now-casting, current-quarter GDP a typical method would be using small bridge equations containing monthly data to forecast current quarterly GDP via these small models. Consequently, (Baffigi *et al.* 2004) and (Runstler and Sedillot 2003) could be counted as an example bridge equation method.

Until recently predicting the present has been considered as a challenge for academic researchers working on specific issues like listed above or central bankers and other government agencies as a extension of their duty of managing level of economic activity. But in this paper we claim that contemporaneous forecasting of credit demand in high frequency could have crucial importance on operations of banking industry. We assume that by estimating weekly credit demand of retail side, banks could regulate their loanable funds stock more efficiently and place their campaigns as soon as it's necessary. However it should be noted that a high frequency forecasting on weekly basis could require more specific econometric methods such as mixed model estimations or appliance of high level time series methods. On the other hand, because our goal in this paper is to familiarize readers on now-casting weekly outstanding credit figures using web searching trends we didn't prefer complicated methods in this paper. However, we believe that using such valuable data in high frequency future researcher could create more advanced models.

The remainder of this article is organized as follows. Section 2 explains the outstanding credit conditions in Turkey. Section 3 investigates the previous literature and section 4 presents results of empirical application. Section 5 summarizes the paper.

2. Outstanding credit conditions in Turkey

As briefly introduced above, in this paper we investigate a rather different side of economic activity, personal finance demand of individuals in Turkey. As an emerging country, majority of the population compromises of youths with increasing disposable income, consumer spending in Turkey increases steadily for almost a decade[1]. Consequently, private income's contribution to 4.0% YoY increase in Turkish GDP came at 3.1% level (translating about 80% of all increase in GDP is explained by domestic demand) by the end of 2013.
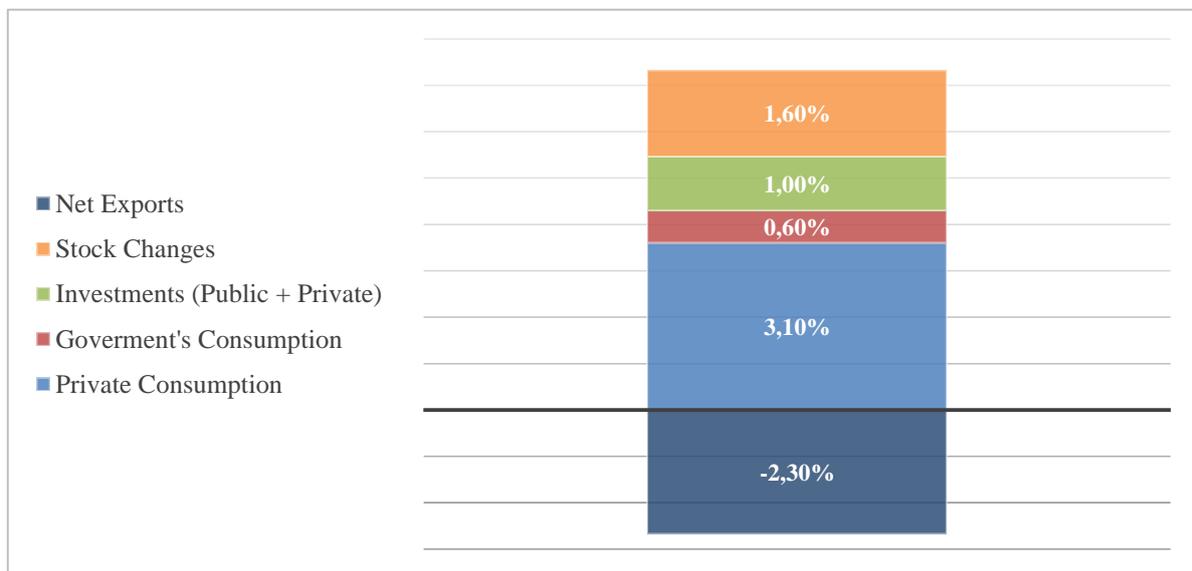

Source: TURKSTAT

Figure 1- Contribution of Demand Chapters to 4% YoY GDP Growth (2013)

Moreover, total amount of personal finance in Turkey has reached approx. US$250bn by the end of same year. The banking regulator Banking Regulatory and Supervision Agency of Turkey (BDDK)'s figures presents that nearly half of this figure (US$141bn) is concentrated in general

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[1] TURKSTAT http://www.turkstat.gov.tr/HbGetirHTML.do?id=16193

purpose loans[2] segment, while rest of the personal debt is listed under mortgages, vehicle and overdraft/credit card loans. However because Turkish private consumption is largely consists of imported consumer products and local savings standing at very low-levels, the funds needed to stimulate this growing consumer economy needs to be financed from aboard. Consequently financing huge volume of funds from aboard creates extensive imbalances in Turkey. In order to regulate this unbalanced growth, from 2011 to 2013 government utilised different kinds of macro-prudential measures to drown-down loan growth which reached to 40% YoY by 2010 to more moderate %15 levels in 2013.
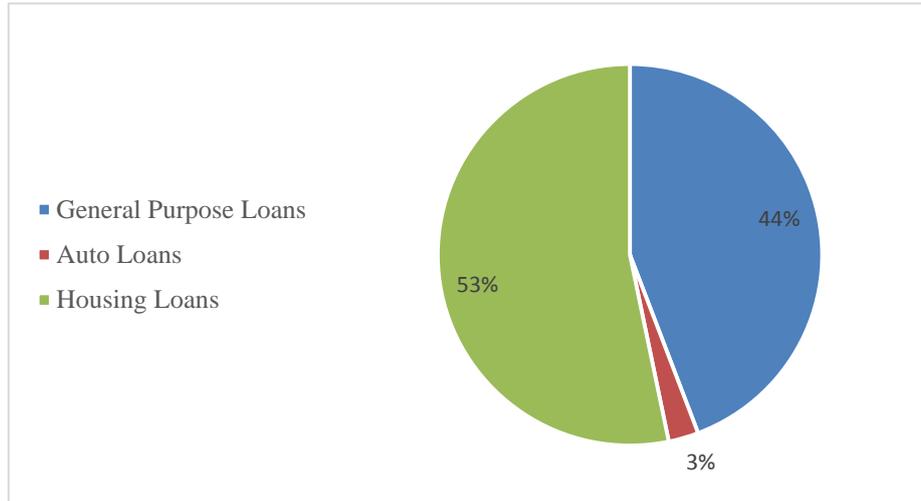
Source: BDDK

Figure 2 - Breakdown of Out Standing Personal Finance in Turkey

As (Basci 2006) stated, the rapid growth in emerging countries bring problem of responding credit booms on policymakers table. On the other hand, one should not be miss out that any measure against credit boom could only be effective when the intervention comes at the right time, after annual credit growth reaching high levels and household debts hitting the top it would be extremely challenging to rebalance economic activity. On the contrary, when we leave macro ground and focus on micro company view; if you are a bank with a large stockpile of loanable funds it's very important to plan supply of this capital. Offering funds when the credit conditions are dull would face bank with unfavourable lending conditions. That's why monitoring real time credit demand has crucial importance for the banks either.

BDDK is responsible from publication of banking sector statistics. Each week the agency publishes weekly banking statistics with a one week of lag (as of 12 Sept. We are able to reach 5th Sept's data). Regarding economic indicators, one week lag could be counted as an acceptable delay but if you are central banker commissioned with daily monitoring of credit conditions or a sales manager of a retail bank responsible from weekly planning of consumer loan campaigns, a 7 day of delay could cause some important problems. Respectively, in following sections we will try to build a reliable model to foresee level of outstanding credit volume both for central bankers and also both for commercial bankers. While seeking a reasonable proxy for estimating current outstanding GPL volume, as keeping in mind that this volume translates to current outstanding GPL credit demand, we preferred using web searches as a proxy of credit demand.

3. Literature review

After emerge of internet as main source of information in late 1990s, first studies on the relation between web searches and macro-economic variables have started by early 2000s. (Kuhn and Mikal 2002) argue that does web search has an positive impact on unemployment period of US job seekers, and they were unable to find any significant statistical relation between being a job seeker

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[2] http://ebulten.bddk.org.tr/haftalikbulten/index.aspx

using web search could shorten period of being unemployed. On the other hand, (Ettredge *et al.* 2005) was the first study which aims to now-cast unemployment rate in US, especially a reasonable time before the BLS report of unemployment subsequent year. However due to lack of data availability they prefer to make an indirect forecast of unemployment rate via using number of jobseekers on internet. Consequently, Google's launch of Google Insights in 2007 (Google Trends after 2012) enables researchers to employ strong proxy variable for forecasting any trend. (Choi and Varian 2009 a,b) described how can Google Trends helps to predict several economic indicators. However widespread recognition of web search data as an indicator of present came up with 2009's H1N1 Flu Pandemic. Flu Trends a service by Google has already been launched in 2009 and a model behind the system was continuously scoring a flu activity probability of a specific region by using 50 million queries entered search engine every day. (Polgreen *et al.* 2008), (Ray and Brownstein 2013) and (Cook *et al.* 2011) has confirmed Google's claim that search data is capable for estimating H1N1 pandemic activity which out broke in 2009. When we checked economics area, (Guzman 2011) examined Google data as an estimator of Israeli inflation. As we stated earlier because now casting current economic activity is central banker's main challenge, we could also see several works by central bankers aiming to estimate current activity, such as (Swallow and Labbe 2011) studied on now-casting car purchases in Chile.

Although studies on prediction power of "Google Trends" have become popular around the world, studies on Turkish case remained limited until now. As far as we know the only study (Chadwick and Sengul, 2012) examined forecasting unemployment rate in Turkey which is announced with a 3 months of lag.

4. Empirical application

Google Trends is a service which provides time series index of volume of searches for a specific keyword at predefined time interval. Introduced in 2007, Google Trends is able to draw, web search data since 1 Jan 2004 to present. Data are delivered in weekly frequency and users served with an index normalized by highest value, fluctuating between 0-100. Due to normalization procedure the date with highest score represents with 100 values, while 0 means there are not enough searches during that particular week. It should be noted that these values are calculating based on a specific keyword provided by the user.

Although it's possible to receive index values on country level, user could also reach regional volume indexes. Finally, as a last remark, due to performance issues Google Trends data compute by using a sampling method and that's why results could vary day to day. It's clear that important characteristic of the data could cause measurement error in the model, but (Swallow and Labbe 2011) test the variation of the indices by downloading index data on a keyword 50 times in 50 day and they stated that measurement error is as source of concern because it weakens information contents of Google data thus it makes more difficult to reject the null hypothesis tested. Flowingly, because researchers have no access to raw data, they suggest Google to provide cleaner data available in the future.

We collected data form both Google Trends Index and BDDK's Weekly Outstanding General Purpose Loan figures. Google Trends Index is calculated based on key word "İhtiyaç Kredisi" which means "General Purpose Loan (GPL)" in Turkish that is downloaded from Google Trends web page at 20 September 2014. Because of sampling procedure on data which is argued above, the exact timing of data collection is crucial in analysis. Regarding credit demand indicator, the total out-standing GPL volume of Turkish Banking System is downloaded from BDDK's statistics web page in weekly frequency. It should be noted that a flow data for credit stock is only available for quarterly frequency, so for a high frequency analysis such like this one, researchers have to use outstanding figures. Each row constitute volume of GPLs in TRY by the end of week while Google Trends data prints weekly search performance for specific keyword.

We use weekly data start from first week of March 2011 to second week of September 2014 thus we have 185 observations. Figure 1 shows the time series graphs of Google Trends Index of "General Purpose Loan" (GT) and total out-standing volume of Turkish Banking System (BK).
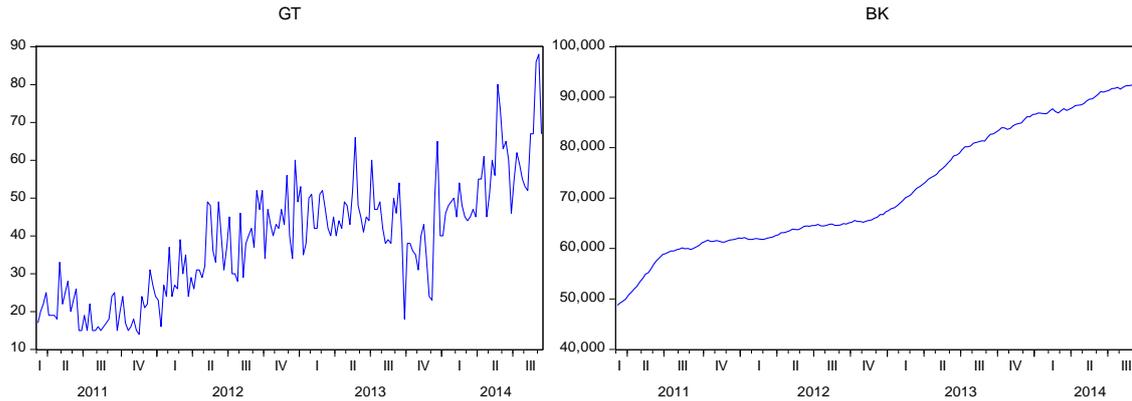
Source: Authors Calculation

Figure 3 - Graph of GT and BK Series

Choi and Varian (2009) used a simple AR process to forecast time series. So they defined yt the log transformation of the observation at time t. Because they used monthly data, AR-1 model is defined as follows:

$$y_t = b_1 y_{t-1} - b_{12} y_{t-12} + e_t \tag{1}$$

We use weekly data hence we take a first and fourth lag of the log of the BK (LBK) to show effect of first week and first month. To estimate the model we use in sample period, 3 May 2011- 08 August 2014 period. The estimated model is below:

$$LBK_t = \beta_0 + \beta_1 LBK_{t-1} + \beta_2 LBK_{t-4} + \varepsilon_t \tag{2}$$

Table 1 shows the result of the estimated model of equation 2. Except intercept all coefficients are statistically significant in 1% level and the model is statistically significant according to F statistics in 1% level.

Table 1- Estimation results of baseline model

Dependent Variable: LBK		
Variable	Coefficient	Std. Error
C	0.025893	0.018953
LBK(-1)	1.217201***	0.026902
LBK(-4)	-0.219420***	0.026459
R-squared: 0.999527		
Adjusted R-squared: 0.999521		
F-statistic: 182597.6***		
*** indicates significance at the 1% level		

Source: Authors Calculation

To see whether google trend (GT) variable has impact or not on BT, it is added to model. Table 2 shows the model with GT variable. However, after GT variable added to model significance of the intercept and value of R-squared increased, the significance of the GT variable is low (10%). Regarding to this model we can say that the google trend data can be used as a forecaster of BK series with positive effect on it.

Table 2 Estimation results of model with google trend data

Dependent Variable: LBK		
Variable	Coefficient	Std. Error
C	0.055034**	0.025749
LBK(-1)	1.212179***	0.026707
LBK(-4)	-0.217158***	0.026391
GT	4.44×10^{-5}*	2.67×10^{-5}*
R-squared: 0.999534		
Adjusted R-squared: 0.999526		
F-statistic: 122972.9***		
*,** and *** indicate significance at the 10%,5% and 1% level.		

Source: Authors Calculation

After the forecaster variable is defined other important question would be whether the GT variable improves forecasting performance or not. To check this, we use forecasting evaluation criteria to compare the forecasting3 performance of these two models. The used criteria are Mean Absolute Error (MAE), Mean Absolute Percent Error (MAPE), Root Mean Squared error (RMSE) and Theil Inequality Coefficient. The model which has smaller MAE, MAPE and RMSE has a better forecasting performance comparing to other one. On the other hand the model whose, Theil inequality coefficient is close to zero would has better forecasting performance than the other one.

Table 3- Forecasting performance of two models

	Baseline Model	Model with GT
MAE	0.002823	0.002776
MAPE	0.025294	0.024872
RMSE	0.003487	0.003459
Theil Inequality Coefficient	0.000155	0.000155

Source: Authors Calculation

Table 3 shows that all criteria of model with google trend data have smaller values than baseline model. Thus we can say that google trends variable has a positive impact on forecasting performance of total out-standing volume of Turkish banking system.

The final step of the empirical application is calculating out of sample forecast performance for the 8/15/2014- 9/12/2014 period. We employ the following equation for the calculations.

$$\widehat{LBK}_t = \beta_0 + \beta_1 LBK_{t-1} - \beta_2 LBK_{t-4} + \beta_3 GT_t \tag{3}$$

Forecasted values were calculated using actual data of the variables. To see the performance of the model we calculate proportion of absolute deviation from the actual values of forecasts.

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[3] We used static forecast.

Table 4 Forecasting performance of out of sample forecast

Term	$\widehat{LBK_t}$	LBK_t	$\widehat{BK_t}$	BK_t	$\left\lvert (BK_t - \widehat{BK_t})/BK_t \right\rvert$
8/15/2014	11.43098	11.43245	92132.22	92268	0.001472
8/22/2014	11.43431	11.43243	92439.53	92266	0.001881
8/29/2014	11.43592	11.43383	92588.48	92395	0.002094
9/05/2014	11.43681	11.4384	92670.92	92818	0.001585
9/12/2014	11.44074	11.44503	93035.83	93436	0.004283

Source: Authors Calculation

Table 4 shows the absolute deviation. Maximum value of the deviation is 0.004283 and the mean of the deviation is 0.002263. We have also had success with out of sample period.

Conclusion

This paper provides empirical evidence for using Google Insights Search data to now cast total out-standing volume of personal finance among banking system in Turkey. We use weekly Outstanding General Purpose Loan and Google Trends Index data for the is calculated based on key word "İhtiyaç Kredisi" which means "General Purpose Loan (GPL)" for the 3 May 2011- 08 August 2014 period.

Our findings show that Google Trends data has significant explanatory power on forecasting of credit demand variable. So it could be employed to monitor nearly - real time developments in personal credit demand. However it is obvious that using lagged variable of first week and first month are very naïve forecasting method and indigenous lagged variables could absorb much of exogenous variables forecasting performance. However because our goal in this paper was introducing google trends as a capable forecasting instrument in high frequency economic activity data we didn't employed more complex forecasting methods and also we didn't test whether GT is the perfect forecasting instrument among other exogenous variables. As we proved that the series has a significant explanatory power these question would be subject of following studies.

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COMPARISON OF COUNTRIES BY THE SYSTEMS OF HEALTH INSURANCE

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Abstract:

Health care systems are different in different countries. Although there are significant differences among them, in particular with regard to methods of financing, regulation, management and organization, their common feature are ambitions to achieve the primary objective in terms of improving the health status of the population in the country and therefore solve the daily question of prioritization of satisfying health needs. The reasons for the rising costs in the health care systems are multi-dimensional. We can mention in particular deterioration of the general condition of the human environment, way of life and raising the level of human medicine, which requires expensive equipment by medical technique, medications, highly qualified personnel, etc. The submitted article provides a macro view to the issue of efficiency of health care systems, public health and its main objective was the evaluation and classification of countries ranking according to used health insurance system. Reported outcomes constitute a valuable analytical platform for the design hypotheses in the issue of health care systems effectiveness, as well as subsequent research in this area.

Keywords: systems of health insurance, public health insurance, private health insurance, Beveridge model, Bismarck model, health care.

JEL Classification: I11, I13, I19.

1. Introduction

All developed countries have ensured the care of the health of its population (Barták, 2012). Public health is the science and art of protecting and improving the community health through health education, health promotion, research and disease prevention strategies. It is the knowledge and application of multidisciplinary, population-based research methods, teaching and implementation including various academic disciplines (WHO) (Michalski *et al.* 2014; Michalski, 2014a, b). WHO defined in the 1988 public health as "the science and art relating to how it is possible through the joint efforts of the society to prolong life, prevent disease and promote health." With the use of this term is also linked to many unclear definitions and imprecise terms. We follow the referred definition, because it reflects the social activities that aim to protect, maintain and improve the health of the population care (Mura and Buleca, 2012; Mura *et al.* 2012; Szabo *et al.* 2013). For public health is typical population approach to health because the object of interest is the state of entire population health or population groups, which are in terms of to the health risk-bearing (Soltes and Gavurova, 2014a,b). At present, these groups represent mainly the elderly, the disabled, children of one parent or dysfunctional families, ethnic minorities, immigrants, long-term unemployed, etc. In the current view and approach to the definition of public health is a clear emphasis on social and political concept based on medical aspects, aimed at improving health, prolonging life and improving the quality of whole population life through health promotion, disease prevention and other forms of healthcare interventions (Rovný *et al.* 2011).

2. Healthcare systems of developed countries

Health care systems in developed countries can be classified according to the way how people in the country pay for provided medical services in the so-called public health, funded by tax through the state budget, health care financed by public health insurance – so called "Bismarck model" and health care largely market-oriented, where the crucial role is playing private health insurance (Szabo and Sidor, 2014; Pudlo and Szabo, 2014; Dorčák *et al.* 2014; Barták, 2012; Barták and Dlouhý, 2013).

As a prototype of the Beveridge model, we can mention the National Health Service (NHS) in the United Kingdom. It is an integrated model of state health care funded by tax and excels with a high solidarity of state guaranteed health care for all citizens. Variants of this model can be found in European countries such as Italy, Portugal, Spain, Greece, Ireland, Scandinavia, as well as in the other developed and less developed countries: e.g. in Australia, Canada, New Zealand, Costa Rica, Mexico, in developing countries such as Botswana and etc. (Fried - Gaydos, 2002). The basic framework of the referred systems shows Figure 1.
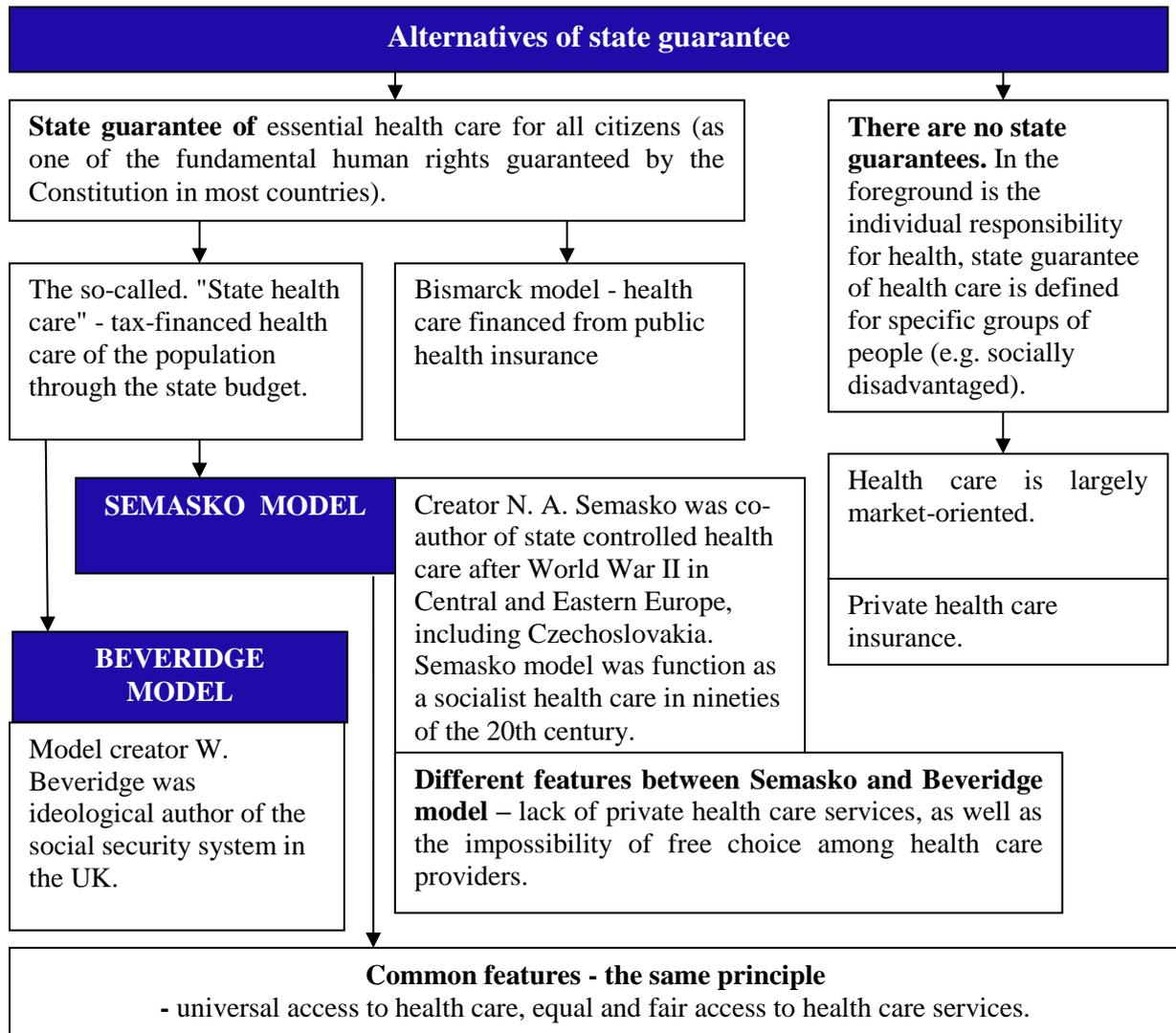
Source: own processing

Figure 1 - Three basic models of health care systems in the world

USA represents one of the few developed countries which does not have established health care system, which is guaranteeing the necessary healthcare for the whole population. Characteristic for it is a market respectively liberal model of health care, with a combination of private insurance and financing of health care from public sources (from taxes of individual states through Medicare, Medicaid and the Veterans Health Administration). More than half of the health care volume in the USA is financed by these programs (Fried - Gaydos, 2002). Approximately two thirds of the US economically active population is insured in the private health insurance companies, from which is 70 to 80% of insured persons not insured individual but by the employer as a group of employees of the company. US employers are covering health insurance for their employees and their family members as part of their social programs, even though they have no obligation through Acts. So called pure forms of the health care systems in a real situation does not occur, but their combination respectively

variants. Therefore, in any country in the world it is not possible to find such a health care system, which would be financed from only one source (Gavurová *et al.* 2014). As reported by Kuvíková (2004), there are not two countries, which should have the same methods of health financing. Priorities of public health in the EU countries are varying. On the one hand we can talk about institutional unity in terms of legislative provision, but the differences are in terms of administrative. For comparison, we choose nine countries and specify the main characteristics of their public health (Table 1).

Table 1 - Comparison of the public health specificities in selected countries

Specifics of public health care in selected countries
Finland • well-elaborated system of occupational health, • existence of Institute of the Finnish Institute of Occupational Health, which is research and advisory institute, whose main objectives are research, training of professionals for health and safety at work, advisory services and dissemination of information, • important role are playing health centres at regional level, which ensure a high level: the care of mother and child, immunization program, screening of breast cancer for women in the age group of 50-99 years, screening of cervical cancer for women in the age group of 50-60 years, • priority issues in the field of health education are smoking, nutrition, physical inactivity, reproductive health, reduce the consumption of unsuitable products and the like. Through health education are influenced eating habits.
United Kingdom • for the support and maintenance of public health is responsible the Ministry of Health and the National Health System, • the primary responsibility of the Ministry of Health is leading the development and implementation of health strategies (documents "Saving Lives, Our Healthier Nation"), • primary responsibility for the fulfilment of public health priorities have health institutions, many competencies of public health are delimited on local respectively regional authorities, • each health institution in their organizational structure has "department of public health" which annually compiles a report on the state of the population of the territory, including strategies for improvement at the national level, • in 1992 were developed new approaches to public health - White Paper - Health of Nation. It contains priorities and quantifiable targets for the reduction of mortality in cardiovascular disease, stroke, cancers, mental diseases, venereal diseases and injuries, • harsh criticism of "Health of Nation" for the emphasis on individual behavior to explain the poor health status of the population, the underestimation of important social determinants of health of the poor.
Hungary • in 1991 was founded the National Office of Public Health and Medicine, which is responsible for the supervision of the population health status, immunization program, monitoring the quality of drinking water, air, water, health and food safety, care about working conditions, HIV / AIDS, as well as toxicology, • the national level is represented by 7 institutions of public health, • at the regional level 9 + 1 (including the capital) are public healthcare institutions, 114 municipal and 22 district centres, • application of multi-source financing.
France • area of preventive occupational medicine and environmental health is very strong,

- treatment prevails over prevention,
- at the national level is established the Commission for Public Health,
- the existence of a public healthcare institutions network and Institute of Health and Medical Research,
- public health system is centralized.

Denmark

- the existence of three-level public health system - national, regional and communal,
- at the national level are established 8 departments of public health,
- institutions at the regional level are responsible for hospital care and health promotion,
- institutions at the municipal level are responsible for health protection,
- the existence of the National Programme for Health is approved by the government, the priorities are common with the international priorities of public health,
- established system of financing through tax policy - high redistribution of taxes.

Germany

- system of financing differs from previous,
- implemented prevention programs and projects, including the immunization program and the public health is funded through health insurance,
- at the state level is centred public health issue,
- the scientific research activities in public health and the involvement of universities are positive evaluated,
- the federal level and state level legislation is fundamental in the public health.

Austria

- at the federal level are established six federal institutions for the quality of drinking water, air, hospital care, transmissible diseases, including HIV, AIDS
- 2/3 of health protection and promotion is funded by health insurance (the remaining part is covered by grants, EU, private funds, etc.),
- state is defining national priorities and maintain a system of government tasks,
- at regional level are established departments of health protection, counselling services and education of the population to health.

Sweden

- according to international standards, the health status of the population is one of the best
- in the country have the longest life expectancy (76.2 years for men, 81.4 years for women), in the world ranking belong to the countries with the oldest population,
- effective programs implemented by Swedish government are oriented for example to the diseases and mortality from cardiovascular diseases and diseases due to alcohol,
- Committee for Public Health published in 1991, the National Strategy for Health, which included tactics to improve the health state of the Swedish population,
- in 1992 was established by the Swedish Government the National Institute of Public Health, where implementation of its plans for health promotion focuses on alcohol, drugs, tobacco, unintentional injuries, women exposed to specific health risks,
- governments privileges are primarily preventive measures, such as struggle against alcohol addiction, currently receives in the attention the question of unemployment, the environment and etc.,
- it is addresses the long-term question of environmental and with it related environmental health risks: environmental pollution and traffic, radon in soil, smoking, noise.

Norway

- public health is organized in a three-level system
- in order to minimize the distance between the environment and the patient were maximum

> responsibilities decentralized,
- governments are responsible for health promotion, disease prevention, injury prevention and for immunization program,
- to the Ministry of Health and Welfare is subordinated 7 specialized equipment of public health,
- Act from 1984 on health care was in 1987 extended to other environmentally oriented health activities: decentralization and delegation of responsibilities, obligation to inform, evaluation of health effects, public information, sanction measures,
- Since 1990, special attention is devoted to the four spheres: asthma, allergies and disorders caused by indoor air pollution, psychosocial disorders, musculoskeletal disorders, injuries after accident,
- to other public health programs include: cervical cancer screening, breast cancer screening, colorectal cancer screening,
- to Norway's long-term plans include a reduction in the number of smokers to 20%,
- elaborated Action Plan for reducing the number of diseases infected with sexually transmitted diseases, especially HIV / AIDS.

Source: own processing by Rovný (2011), Hnilicová (2012)

For the health care systems of developed countries in the current period are characteristic by increased interest in monitoring economic efficiency of healthcare services, with an emphasis on the monitoring of the resources using. This is also reflected in a significant pressure on the application of optimal paying methods for provided healthcare in the interests of an objective copying performance of health care providers, as well as satisfaction on the side of the patient. Health care systems are affected in significant extent also by globalization. On a global scale globalization is forcing them to preparedness for solving problems with emergence of various infectious diseases, epidemics, terrorist attacks and etc.

3. The classification of countries according to health insurance systems

The basic idea of our research was to combine research conducted on the basis of the index - EHCI and health expenditure "per capita" in specific European countries which are members of the OECD. Index EHCI is focused on patient satisfaction surveys in different areas of provided health care. The index does not take into account the "financial costingness", which is expended to achieve a given level of health care quality and related services. In Europe are dominating two systems and the provision of health care financing and this are Bismarck and Beveridge model. We chose the 24 European countries that are also members of the OECD and therefore are available data in OECD Health Data 2012. These countries are divided into the above mentioned systems and into the provision of health care financing the results are shown in Table 2.

Table 2 - Countries distribution according to the model of health care provision

Model of health care provision	
Beveridge:	**Bismarck:**
➢ Finland	➢ Germany
➢ United Kingdom	➢ Austria
➢ Denmark	➢ Netherlands
➢ Sweden	➢ Luxembourg
➢ Iceland	➢ Belgium
➢ Norway	➢ Switzerland
➢ Ireland	➢ France
➢ Italy	➢ Czech Republic
➢ Greece	➢ Slovakia

➢ **Spain**	➢ **Estonia**	
➢ **Portugal**	➢ **Slovenia**	
➢ **Hungary**	➢ **Poland**	

Source: own processing based on http://www.ncbi.nlm.nih.gov/pmc/articles/ PMC1934356/ and http://healthmatters4.blogspot.sk/2011/01/bismarck-model. html

For research we used the report produced by the Health Consumer Powerhouse from the 2012. It compares 34 European countries. These countries were compared with the database OECD Health Data 2012, which gathers the most recent data from the 2010. Report confrontation from 2012 and data from 2010 is not in conflict, because the data collected as a basis for the compilation of the index - EHCI were obtained in 2010 -2011. In comparison of 34 countries with the OECD countries and data from the OECD Health Data 2012 were excluded 10 countries. As a benchmark against which we compared the financial costingness of providing health care, we determined the average level of expenditure in OECD expressed in USD and in "per capita". Countries could deflect from this average, positive or negative (any aberrance from the mean we consider as undesirable). The absolute value of aberrance is determining the ranking of the country. Countries with the smallest deflect obtained the lowest numerical value 1. The order of countries is shown in Table 3.

Table 3 - Countries ranking according to the difference between the OECD average and the total expenditure "per capita" in health care

Ranking	Country	Monitored value	Ranking	Country	Monitored value
1.	Finland	17	12.	Germany	1070
2.	Iceland	41	13.	Austria	1127
3.	United Kingdom	165	14.	Slovakia	1173
4.	Italy	304	15.	Denmark	1196
5.	Greece	354	16.	Czech Republic	1384
6.	Ireland	450	17.	Hungary	1667
7.	Sweden	490	18.	Netherlands	1788
8.	Portugal	540	19.	Poland	1879
9.	Belgium	701	20.	Estonia	1974
10.	France	706	21.	Switzerland	2002
11.	Slovenia	840	22.	Norway	2120
OECD average					**3268**

Source: own processing based on data from the OECD Health Data 2012

Ranking compiled on the basis of index EHCI we adjust to the current number of 24 countries surveyed by us. Top rated country received the lowest grade and the worst placed country could reach a maximum value of 24 (see Table 4).

Table 4 - Ranking of selected countries based on EHCI 2012

Country	Ranking in EHCI	Our ranking by EHCI
Netherlands	1	1
Denmark	2	2

Country	Ranking in EHCI	Our ranking by EHCI
Iceland	3	3
Belgium	5	4
Sweden	6	5
Switzerland	7	6
France	8	7
Norway	9	8
Finland	10	9
Austria	11	10
UK	12	11
Ireland	13	12
Germany	14	13
Czech Republic	15	14
Slovakia	16	15
Estonia	18	16
Slovenia	19	17
Italy	21	18
Greece	22	19
Portugal	25	20
Poland	27	21
Hungary	28	22

Source: own processing on the basis of EHCI 2012

We subsequently counted positions in both charts. Country with the lowest value obtained the best placement, in case of countries with the same number of points we used the arithmetic mean of their placement. Based on this placements in the charts and associated scores (lowest number - best placement) we assigned to two basic groups of countries their score, as can be seen from Table 5.

Table 5 - Ranking of countries according to own criteria

Country/Model	Beveridge	Bismarck	Position in the rankings
Finland	x		1,0
UK	x		5,0
Hungary	x		16,0
Denmark	x		5,5
Germany		x	11,0
Austria		x	9,0
Sweden	x		3,0
Netherlands		x	7,0

Country/Model	Beveridge	Bismarck	Position in the rankings
Iceland	x		1,0
Belgium		x	4,0
Switzerland		x	12,0
France		x	5,5
Norway	x		14,5
Ireland	x		6,0
Czech Republic		x	14,5
Slovakia		x	13,0
Estonia		x	15,0
Slovenia		x	12,5
Italy	x		8,0
Greece	x		10,0
Portugal	x		12,5
Poland		x	17,0

Source: own processing

Based on the results from the Table 5, we can conclude that the countries grouped under the Beveridge model on average have better position in the rankings at the 7th place in comparison with countries that use the Bismarck model with mean placing the tenth place. In future would be better to use also other economic and medical variables, from which for example Health Consumer Powerhouse survey abstracts.

Conclusion

Health care financial sustainability represents one of the main problems of each country. The findings of the OECD (2010) declare that in all its member countries was recorded faster growth of total expenditure on health care compared with the growth of their economies. It evokes in many countries a huge challenge and at the same time offers the opportunity to find an effective way to provide high quality health care, taking into account available resources. Demographic projections indicate an increasing dominance of demand for health care and its costs. Growth forecasts of population over 65 in 2020 and 2040 indicate that the proportion of retirees will increase significantly in all EU countries.

Therefore, measuring the effectiveness of health care systems is becoming a major question particularly because of its methodological complexity, as well as problems related to variations in health care systems, infrastructure, market dynamics, epidemiology and demography. We must realize that any comparison of countries and their systems, we will not be sufficient in assessing benefits of pluralistic or unitary system of public health insurance. It Is necessary to focus primarily on the precise mapping of all possible sources of increasing the efficiency of the health care system, its determinants, and reveal hidden reserves of significant financial savings. Simply said, if we want to effectively manage something, we must first know measure it.

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