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Panel Analysis of the Influence of Macroeconomic Factors on the Household Savings

Ján BULECA
Faculty of Economics, Technical University of Košice, Slovakia
jan.buleca@tuke.sk

Peter TÓTH
Faculty of Economics, Technical University of Košice, Slovakia
peter.toth@tuke.sk

***Abstract**:*

The current deepening fall in real consumption is caused by slight increase in nominal disposable income, increased inflation, as well as by the tax changes and developments in the savings rate. Looking at the savings rate in the Euro zone different household responses could be observed. This paper focuses on monitoring of the development of disposable income, household consumption and savings in the Visegrad Four countries in the period 2005−2014. The analysis covers impact of selected macroeconomic indicators (gross domestic product, disposable income, inflation rate, and unemployment rate) on volume of household savings using the panel regression. Within the analysis three models were used: pooling model (PM), fixed effects model (FEM), and random-effects model (REM). Performance of the analysis proved that in all three models the GDP has a statistically significant impact on household saving. The GDP increase by € 1 million caused an increase in gross domestic savings by € 0.20464 million.

Keywords: consumption, savings, gross domestic product, unemployment rate, disposable income.

JEL Classification: E20, E21, E257.

1. Introduction

Family saving and assets building has the potential to promote well-being across the life span. Assets symbolize household stability and serve as a safety net against unexpected life events *(e.g.* illness, unemployment, divorce). Households' stability could be affected by households' financial behavior under changing macroeconomic conditions. Saving represent one of the most important economic activity of households from both microeconomics and macroeconomics point of view. At microeconomic level household savings ensure stable level of consumption during the time of income reduction, aggregated household savings at macroeconomic level can be used as a source of investments (Zhuk 2015). Savings accumulation is also an element that shapes the pension policy system, particularly in the segment of individual, voluntary savings products that can be burdened with a considerable value impairment risk, which results from macroeconomic factors (Pukela and Adamisin 2015). The Korean households used to first purchase deposit or protection-type insurance, and then subscribe to private pension plan or savings-type insurance (Choe 2008). Horioka, Suzuki and Hatta (2007) in their analysis of impact of population aging on Japan's household savings rate and on its public pension system have found, that the rapid aging of Japan's population is causing Japan's household savings rate to decline and this decline can be expected to continue. The family saving decision making procedure usually consists of four steps: a) whether to save or not; b) how much to save; c) which savings tool to choose; and d) how to allocate savings in each tool (Choe 2008).

The main source of households' uncertainty comes from labor income generation, which is critically determined by unemployment. Fuenzalida and Ruiz-Tagle (2009) stated that households' financial vulnerability depends on their indebtedness levels and on the fragility of their income sources to be able to fulfil their obligations. Analysis of the factors affecting savings decision making process showed, that the incomes from different sources had different impacts on savings, and the risk tolerance also had a partial influence (Choe 2008). Zhuk (2015) in his investigation of the most influential macroeconomic factors that determine household savings formation in Ukraine proved that levels of such macroeconomic indicators as gross domestic savings, household consumption expenditures and gross national income were of first order of integration and had unit root. Badun and Franic (2015) examined the impact of selected macroeconomic indicators (wages, interest rate, stock exchange index, availability of loans and unemployment rate) to the housing savings in Croatia within the period 2000−2013.

According to research of Harris, Loundes,and Webster (2002) provided in Australia, income and wealth are positively and significantly related to the propensity for households to save, and the level of the interest rate has little or no influence. They indicated also impact of age, pessimism in their outlook, home ownership, children and their number, unemployment, disability, sole parent payments, and the area of residence. Horioka and Wan (2007)

analyzed the determinants of the household saving rate in China for the 1995–2004 period. They found that China's household saving rate has been high and rising and that the main determinants of variations are the lagged saving rate, the income growth rate, (in many cases) the real interest rate, and (in some cases) the inflation rate. Chamon, Liu and Prasad (2013) described markedly increased China's urban household saving rate since the mid-1990s as well as the U-shaped the age-savings profile caused by rising income uncertainty and pension reforms. Modrakova, Hetes and Soltes (2014) were analyzing saving on pension in Slovak conditions. Mishra and Chang (2011) examined the factors affecting tax-deferred retirement savings among the farm households. Their results indicated that demographic factors, total household income, off-farm work, and risk preference play important roles in retirement savings plan participation. Retirement savings increase with household size, intensity of off-farm work by farm operator and spouse, and size of farming operation. They found that the amount of retirement savings decreases with operator's age and increases with spouse's age, and that cash grain and dairy farmers have lower retirement savings. Analyses of Pukela and Adamisin (2015) indicated the increasing importance of insurances and their role in shaping of household savings portfolios. Finlay and Price (2015) proved that households' saving ratios tend to increase with income, but decrease with wealth and gearing. More at-risk households such as single-parent and migrant households tend to save more than other households, all else being equal. Niculescu-Aron and Mihaescu (2012) stated that economic growth reflected by percentage of GDP increase determines a decrease of savings, since a 1% increase determines a 0.35% decrease of the saving rate. The inflation rate has a direct influence on saving, a 1% change determining an almost 0.07% change in the same direction of saving rate. Adema and Pozzi (2015) investigated the cyclicality of the household saving to household disposable income ratio for a panel of 16 OECD countries over the period 1969–2012. They found that three main determinants of household saving (i.e., unemployment risk, household wealth and credit constraints) have a significant impact on the household saving ratio. Households' debt increased the importance of financial counselling and planning, and financial education for households is getting more attention to improve the ability to financial management of households (Kim 2015).The significant relationship between the savings and investments exists and the dynamic of savings depends on the development of economy and vice versa (Bikas, (2008), Andrejovska and Banociova (2013)). Results of Jongwanich (2010) provided in Thailand (1960–2004) suggest that an increase in economic growth, inflation and terms of trade all have a significant positive impact on household and private saving rates. In contrast, the availability of bank credit tends to reduce household and private saving rates. Furthermore, public saving seems to crowd out household and private saving, but less than proportionately. This reflects a possible role of fiscal policy in increasing national savings in the economy. Over and above these variables, corporate saving is another important determinant of household saving. An increase in the former brings about a significant reduction in the latter. Similar results were described in works of Hajdu, Andrejkovic and Mura (2014), Soltes and Gavurova (2014), Banociova and Raisova (2012), Hakalová *et al.* (2014), Glova (2014), Mirdala (2014), and Michalski (2014).

Among the many factors that influence the saving propensity of the population, especially in Central and Eastern Europe, the most visible ones were those concerning the security and stability of income, something obvious in the context of the recession. During economic prosperity, families save money either because they have an excess from the income increase or they anticipate significant gains from interests, either because they are stimulated to save through adequate fiscal policies or/and they believe in the favorable evolution of the economy. On the other hand, 2008 brought a shock for all European states, which determined major changes in the saving behavior and the two groups of countries reacted differently. In Western Europe the saving rate decreased.

2. Materials and methods

The data were structured as panel data from the Eurostat (2015) and OECD databases (2015), and consisted of the Visegrad Four countries: Czech Republic (CZ), Hungary (HU), Poland (PL) and the Slovak Republic (SK). For the assessment of macroeconomic situation, first part of the article contains observation of disposable income and household consumption development, and consequently the level of household savings in the analyzed countries in the period 2005–2014. Households were represented by citizens, entrepreneurs, and non-profit institutions serving to the households (structure of the Eurostat 2015).

In the second part of the paper the impact of selected indicators on the gross household savings was quantified. Macroeconomic indicators were chosen on the basis of theoretical knowledge (Aron *et al.* 2012, Duca and Muellbauer 2013) including gross disposable income, gross domestic product, unemployment rate, and inflation rate. We investigated the influence by a panel regression used in the work and Hsiao *et al.* (2006) and Boubtane *et al.* (2013), *where*:

- Explained (dependent) variable represented by S - the volume of gross savings in the € millions;

- Explanatory (independent) variables were represented by:
  - GD: GDP in € millions, b. c., - UR: Unemployment rate in %,
  - IR inflation rate in %, - DI: gross disposable income in € millions.

General panel model has been defined as:

$$y_{it} = \alpha + \beta_{it}^{T} x_{it} + u_{it}$$

where: y_{it} is the dependent variable (gross household savings); x_{it} is the vector of explanatory variables (GDP, disposable income, unemployment rate, and inflation rate); I = 1,… n is the index of the country; t = 1, … T is a time index; and u_{it} is the error of the model with mean value equal to 0.

The analysis used three models: pooling model (PM), the fixed effects model (FEM) and the random effects model (REM). PM provided an unbiased and efficient estimate for statistically insignificant individual errors. If individual errors were correlated with any of the explanatory variables, then estimates of the PM and REM models were distorted and the FEM model had to be used. REM model was suitable to use in case the individual errors were statistically significant and uncorrelated with the explanatory variables. Statistical significance of the individual components was tested by the poolability F test.

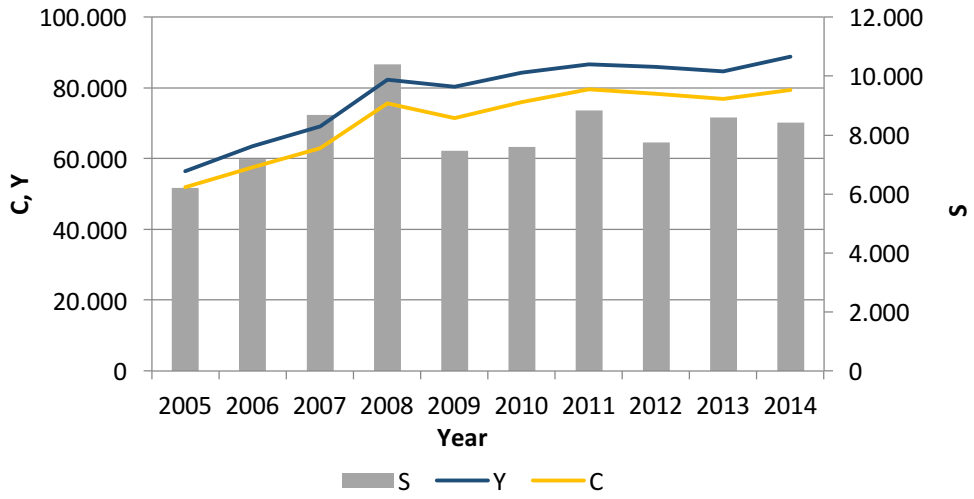
Testing the statistical significance of the individual and the time effects was possible using Lagrange multiplier test and F test based on comparison of PM and FEM models. Hausman test was universal test to compare the suitability of using two different specifications of the models, and two different estimators. In our case, this test was used to select between FEM and REM models. Pesaran CD test tests the cross-sectional dependence in the panel. Estimation of the models has been realized in an R programming environment (R Development Core Team 2014) using PLM package (Croissant *et al.* 2013).

3. Development of household income, savings, and consumption in the Visegrad four countries

Household decisions about how much of their income they will use to present or future consumption has now become the subject of an increasing interest. Household consumption in most countries represents more than half of the GDP, affecting foreign trade and investments. An important factor influencing the volume of savings is amount of household disposable income, which constitutes internal funds for consumption or accumulation of savings, respectively.

Dynamics and the volume of savings, disposable income, and consumption exhibited in individual V4 countries significantly different values (Figure 1, 2, 3, 4).

Czech Republic



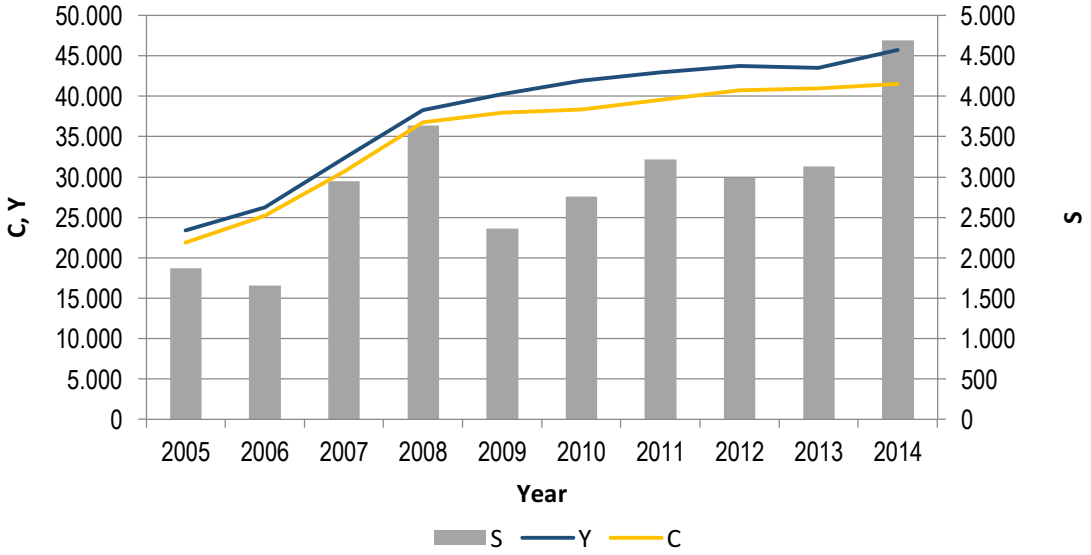
Source: own processing of Eurostat data (2015)

Figure 1 - Development of income (Y), consumption (C) and savings (S) in the Czech Republic within the period 2005–2014 in million EUR

The highest growth in household consumption among the V4 countries was reached in Czech Republic in 2008, it was due to income growth caused by legislative changes (introduction of the flat tax, higher flat rates for a deduction from the tax base for sole proprietorships, proposing an upper limit of insurance for high-income workers) that had a great impact on the record increase of savings. Profit of sole proprietorship as the part of net household

disposable income in 2009 crisis declined year on year. Despite the recurrent year on year growth of household disposable income in 2010, the following development could not be assessed positively. Increase in wages and salaries remained weak, household purchasing power has decreased and the profit of sole proprietorships has decreased again. Although household disposable income increases in 2010, the volume of savings was similar to that in the previous year. In 2011 households kept a greater proportion of the funds from their increased income, which have increased the volume of savings, but only as concerns about future economic developments and uncertain income. The unfavorable economic development in 2012 and 2013, when disposable income decreased, was reflected in decrease in consumption. When compared to 2009, when it was only one drop in the household confidence, in 2012 a negative development was caused by the highest unemployment rate (7.2%). Since 2013 there has been a positive development in disposable income, continued year on year increase in the volume of wages and social benefits. The growth was also influenced by the recovery in the labor market and a partial impact of the tax optimization effect.

Slovak Republic

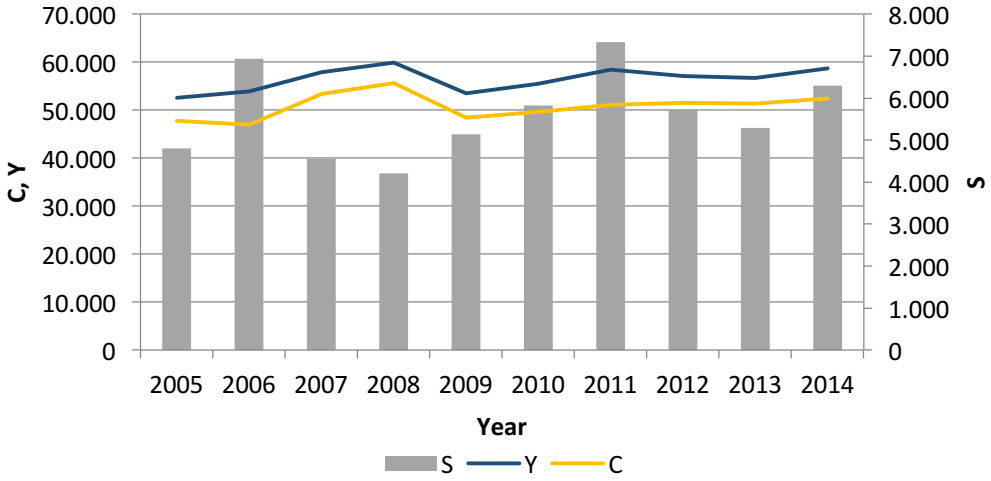


Source: own processing of Eurostat data (2015)

Figure 2 - Development of income (Y), consumption (C) and savings (S) in the Slovak Republic within the period 2005–2014 in million EUR

A similar development of income and consumption until 2008 was recorded also in the Slovak Republic. In 2007 and 2008, the Slovak economy belonged to one of the fastest growing EU member states. In 2009, development has slowed down, but continued to grow, unlike in other V4 countries. This growth was very mild and lasted until 2012. As a result of the global financial and economic crisis, however, the household saving decreased. The crisis was reflected in the structure of household expenditure, when consumption decreased especially in case of long-term goods. Expenditures on hotels, cafes and restaurants, and luxury goods, which are not the subject to daily consumption, decreased as well. Subsequently, in 2010, the level of savings was restored and this development, albeit at a slower pace continued till nowadays. The volume of savings, consumption and income has now reached its highest level in a last decade. Together with the growth of income the consumption increased as well. Expenditures for goods and services for personal care, social and financial services, voluntary insurance and so on, grew up. With the growth of total consumption expenditures, however, the spending on health decreased, and this decrease related to the health services provided outside the hospitals.

Hungary

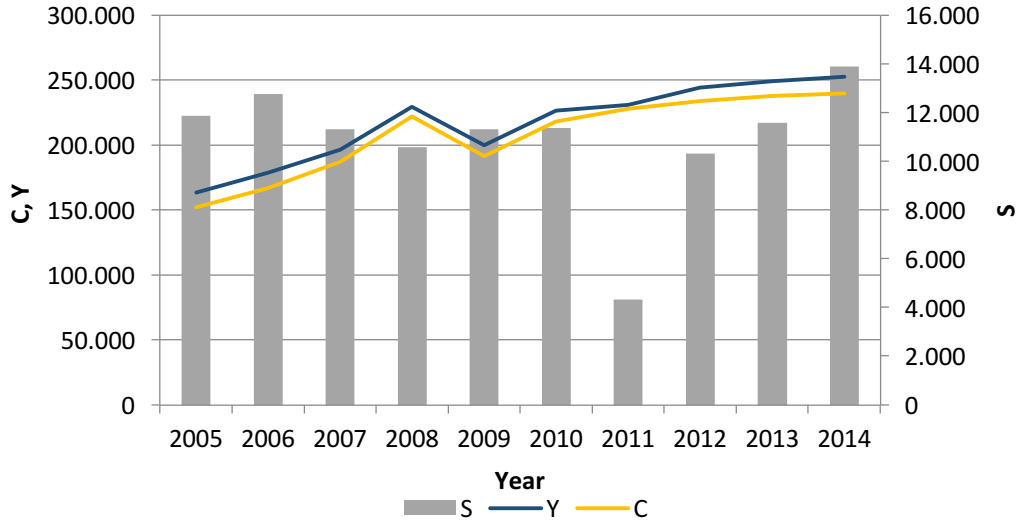


Source: own processing of Eurostat data (2015)

Figure 3 - Development of income (Y), consumption (C) and savings (S) in Hungary within the 2005–2014 in million EUR

Hungary had the worst starting position of all observed countries. Development of disposable income was positive until 2008, when the highest level of income was reached. In the following year income decreased similarly too other V4 countries. The drop in revenues was followed by decrease in consumption, household savings have increased. Regarding the structure of consumption expenditure of households, the overall consumption expenditures in the particular year decreased, but spending on food and non-alcoholic beverages increased. In 2009 due to a sharp reduction in the number of job vacancies, the amount of volume of wages and salaries had decreased and state social system began to pay more for the unemployment allowance, and other social benefits respectively. The citizens used the institute of an early retirement, which further increased the volume of paid retirement pensions. This strengthening of the household resources had a significant impact on the fact, that the disposable household income did not fall, but despite the overall poor situation of the economy it has risen. The most significant increase in volume of savings occurred in 2011. The analysis showed that the year 2009 did not meant for Hungarian households a significant negative change, as it was for example in the Czech Republic, which recorded a decrease in income, consumption, as well as savings. Good strategic location of the country and available natural resources helped them to return to macroeconomic stability.

Poland



Source: own processing of Eurostat data (2015)

Figure 4 - Development of income (Y), consumption (C) and savings (S) in Poland within the period 2005–2014 in million EUR

The Republic of Poland was the second fastest growing economy out of the V4 countries until the crisis period. Until 2008, Polish households recorded positive development in disposable income, but in the following year it has decreased similarly as in other V4 countries. The drop in revenue was followed by decrease in consumption, household savings increased slightly as the households were concerned about future economic developments and uncertain income. Subsequently, since 2009, the disposable income increased along with consumption. Revenues of a social nature grew up, particularly the social benefits for assistance in material need. Since 2010, we can see only slight growth of the revenues. Decrease of individual household consumption expenditures deepened, and together with high unemployment and lower wages caused lower domestic demand. Nevertheless, signals of improvement were the growth of household final consumption expenditure. It was particularly in spending on long-term goods, such as vehicles, household equipment and so on. Due to the decrease in current household income, there was a decline in the volume of savings, followed in subsequent years by their sharp increase. Development of disposable income, consumption and savings in Polish households is positive since 2012.

Evaluation of the development of savings

In the overview bellow the results of comparison of models of savings in individual Visegrad Four countries based on panel data Czech Republic (CZ), Hungary (HU), Poland (PL), and the Slovak Republic (SK), were processed. The models for each country have been compiled from the original panel data. Table 1 shows the Pearson's correlation coefficients, which demonstrated the highest interdependence between GDP and disposable income, therefore disposable income has been excluded from further modelling. No other pair of input indicators was significantly correlated.

Table 1 - Correlation matrix

	GDP	DI	UR	IR
GDP	1.000 ***	1.000 ***	-0.111 *	-0.259 ***
DI	1.000 ***	1.000 ***	-0.112 **	-0.258 ***
UR	-0.111 *	-0.112 **	1.000 ***	0.036 *
IR	-0.259 ***	-0.258 ***	0.036 *	1.000 ***

Source: Own Calculation
Note: ***, **, * represents statistical significance on the probability level 1, 5, or 10 %, respectively.

According to the estimated regression coefficients (Table 2) in all three models GDP and unemployment had statistically significant impact on gross household savings. On the other side, the effect of inflation rate is not statistically significant and it was not analysed further.

Table 2 - Estimated regression coefficients

	Fixed effects model (1)	Random effects model (2)	Pooling model (3)
	Estimate	Estimate	Estimate
Intercept	-	8067.15873	9660.04824***
GDP	0.20471***	0.19993***	0.19654***
Unemployment rate	-949.08364***	-943.23323***	-730.29305**
Inflation rate	108.75331	95.48177	-527.88971
R-Squared	0.54579	0.72716	0.94680

Source: Own Calculation
Note: ***, **, * represents statistical significance on the probability level 1, 5, or 10 %, respectively.

Table 3 - Estimated regression coefficients of adjusted models

	Fixed effects model (4)	Random effects model (5)	Pooling model (6)
	Estimate	Estimate	Estimate
Intercept	-	8517.14406	7845.90000***
GDP	0.20464***	0.19980***	0.19700***
Unemployment rate	-969.70156***	-960.21328***	-732.34000**
R-Squared	0.54572	0.72967	0.94673

Source: Own Calculation
Note: ***, **, * represents statistical significance on the probability level 1, 5, or 10 %, respectively.

REM model (5) has a higher coefficient of determination. According to Hausman's test the FEM model (4) is the most appropriate model, therefore we further described its estimated coefficients. Table 3 shows a positive effect of GDP on gross household savings. GDP increase by € 1 million caused the increase in gross domestic savings by € 0.20464 million. The increase in the unemployment rate by 1 percentage point caused a decrease in gross domestic savings by € 969.70156 million. Both two explanatory variables were statistically significant at the 1% significance level.

Analyzing these indicators, we tried to find out the relationship between savings and disposable income, gross domestic product, unemployment rate, and inflation rate. The results of Lusardi (2015), as well as Pécsyová, Vanko and Machlica (2013) confirmed that the savings rate is affected by income, interest rate, financial wealth, inflation, government savings, and access to credit, and in short term period also the unemployment rate. The analysis showed fluctuating trend of GDP as the only factor positively affecting the volume of savings during the observed period. The most significant decrease was recorded in 2008 in all four countries. The reason for the decline was the financial crisis, negatively impacting the economic development of the country. Assessment of dependence of the household savings to GDP was not confirmed, as the savings rate was affected by a range of regressors (investment rate, inflation rate, the level and degree of financial development) (Ciftcioglu, Fethi, and Begovic 2007, Barro 1996).

Another (negative) indicator was the unemployment rate, which caused a decline in savings. The same findings were described by Carbone and Hey (2004) in their investigation of excess sensitivity related to household consumption, employment and the volume of current income. Their results documented proportional dependency of employment rate, and the volume of consumption, and savings. Similarly, Liptak *et al*. (2015) in their analysis stated, that the unemployment rate and the wages of employees in the V4 countries have a similar development, based on which they characterize it by the common cluster. Disposable income and inflation for the interdependence with the GDP were excluded from modelling.

Conclusion

Income, savings and household wealth are widely discussed topics among professional and scientific community, as well as participating public. Households participate in the entire national economy, and their consumption and savings largely affect economic aspects of the whole country. Our study evaluated a ten-year development and relationship of the volume of savings and macroeconomic determinants affecting them. Understanding the impact of these factors is important not only for future economic planning and determination of prognosis, but also for calibrating of risk, and setting the macroeconomic policy. Out analysis confirmed that GDP had a positive impact on gross household savings. Unemployment had a negative impact on the savings; the increase in the unemployment rate by 1 percentage point caused a drop in gross domestic savings by € 969.70156 million. It remains questionable whether the expert discussions on future development trends and possible modifications of design of our determinants could reach general consensus and consistency.

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System Based Development of the Poultry Sector in Kazakhstan in Mid Term Perspective

Ainur Yergazievna YESBOLOVA
A. Yassawi International Kazakh-Turkish University, Turkistan, Kazakhstan
yesbolova@gmail.com

Mariusz MACIEJCZAK
Warsaw University of Life Sciences, Warsaw, Poland
mariusz@maciejzak.pl

Saltanat Saparbaevna IBRAIMOVA
M. Auezov South Kazakhstan State University, Shymkent, Kazakhstan
ibraimova@gmail.com

Akmaral Lesbekovna AKHELOVA
M. Auezov South Kazakhstan State University, Shymkent, Kazakhstan
maralzhan@mail.ru

Zhanar Orazalievna SABDENOVA
M. Auezov South Kazakhstan State University, Shymkent, Kazakhstan
janar-s@mail.ru

Gulzhan Tohtargazyevna KUNAFINA
D. Serikbayev East Kazakhstan State Technical University, Ust-Kamenogorsk, Kazakhstan
kunafina@mail.ru

Abstract:

The paper is an attempt to present the current state and possible ways of development of the poultry sector in Kazakhstan as a complex adaptive system. It also aims to forecast the possible development of this industry is mid-term perspective. Additionally, it aims to propose the institutional measures that would enhance the development and competitiveness of Kazakhstan's poultry industry as a supply chain based integrated platform. The research is based on the heterodox assumptions of deductive and descriptive reasoning, with the system approach, based on the secondary data coming from various sources. Also various methods of the economic analysis, including the regression analysis and trend models were applied. For this kind of analysis were used secondary data sources. As a primary method, there was applied a multiple regression analysis to forecast the scale of the development of the poultry sector in Kazakhstan.

Keywords: economics, Kazakhstan, multiple factor analysis, poultry, supply chain platform.

JEL Classification: Q00, O13, F15, C69, O21.

1. Introduction

The current development of the agricultural sector in Kazakhstan is primarily aimed to ensure national food security, with special focus on food quality and availability. However, as it was broadly described by Golubov (2010) or Pomfret (2013), there are several problems with fulfilling these objectives, which come of technological, market and institutional sources. To solve these problems, the Kazakh government undertook broad reforms in frames of which assigned the important role to the domestic poultry industry, as one of the branches of agriculture, which is dynamically developing in recent years. The poultry industry has been chosen as a sector from which in a fast way the society could be supplied with valuable protein, due to the fact that other products of animal origin, *i.e.* milk are also in shortage and their supply is much more limited. It is pre-assumed (Wieck *et al*. 2014) that it might be possible to reduce sharpness in providing the population with production of animal husbandry products in the short time due to increase in production of fowl and eggs, which will come not only from agricultural enterprises, but also from peasant (private) farms and household's plots (from the total amount of fowl production 94 % are made in agricultural enterprises and 4% in household's plots) (Yesbolova *et al*. 2015b).

2. Materials and methods

Arutyunyan (2009) suggests that the role of poultry industry in terms of its contribution to provision of animal proteins cannot be over emphasized. The domestic and international experience confirms that poultry industry is capable to increase in short terms production to the necessary level and to provide optimum protein balance of a food allowance of the population. High profitability of poultry production in comparison with other branches is caused by precocity of the birds, a smaller specific expense of forages, energy, and labor and proves expediency of development of this priority direction of agricultural production (Wieck *et al.* 2014).

However, as shown by Akramov (2011), despite increase in production and considerable investments into poultry industry, Kazakhstan remains dependent on import of poultry production - more than a half of the consumed production is imported to the country. It should be noted that the developed tendency of growth of import of poultry meat testifies the growth of volumes of consumption in the domestic market. In the process of increase of consumption level of poultry meat also import volume grows. Kazakh statistics show that 192.2 thousand tons of poultry meats were delivered in 2013. In poultry meat structure of import leads the USA. Besides, low solvency of the population does poultry meat more popular, than other types of meat production. In 2014 own production of poultry meat covered requirements of the population for only 38%, other 62% were fulfilled by import products (Committee on Statistics, 2015).

The main reasons of increase the import of poultry meat to the Kazakhstan resulted from wrong privatization process at the beginning of independence of the Republic (Zhigalin 1998). That has led to destruction of specialized poultry farms and reduction in 2 times of bird livestock (1991 – 59.9 mln. heads, 2015-35.6 mln. heads), as well as a low share of a bird of domestic selection. Yesbolova *et al*. (2015a, 2015b) as well as Tazhibaev *et al.* (2014) argue that poultry producers in Kazakhstan use high-yielding western crosses to produce eggs and poultry meat and there are no major national poultry breeders. One strategic objective for further development of the country's poultry industry should be therefore to build new and expand existing first- and second-level multipliers, so that Kazakhstan is able to reduce imports of broilers eggs in the near future. It would also enable the development of strains suited to domestic demand.

It is argued that poultry development in Kazakhstan, so far has been analyzed selectively, but should be seen holistically, in a wide systemic approach. Moreover, it is necessary to see this system not in a static way, but apply more complex and dynamic approach. It is argued that such dynamic system could be able to adapt in and evolve with a changing environment. As suggested by Thornton (2010) changes in the demand for livestock products have been largely driven by human population growth, income growth and urbanization and the production response in different livestock systems has been associated with science and technology as well as increases in animal numbers. In the future, production will increasingly be affected by competition for natural resources, particularly land and water, competition between food and feed and by the need to operate in a carbon-constrained economy.

The research is based on the heterodox assumptions of deductive and descriptive reasoning, with the system approach, based on the secondary data coming from various sources. To investigate the state of the art of the poultry sector in Kazakhstan there was critical literature review applied. There were national (National Library of Kazakhstan, Virtual Science Libraries) and international (Web of Knowledge, Research Gate, Scopus, Ebsco, Proquest) databases searched in order to identify relevant scientific papers. Out of 254 papers were selected after abstracts review, and 43 were chosen for in depth analysis.

Also, various methods of the economic analysis, including the regression analysis and trend models were applied. For this kind of analysis were used secondary data sources. As a primary method, there was applied a multiple regression analysis (Gataulin *et al.* 1990) to forecast the scale of the development of the poultry sector in Kazakhstan. The purpose of multiple regressions is to predict a single variable from one or more independent variables. Multiple regressions with many predictor variables is an extension of linear regression with two predictor variables. A linear transformation of the X variables is done so that the sum of squared deviations of the observed and predicted Y is a minimum. The computations are more complex, however, because the interrelationships among all the variables must be taken into account in the weights assigned to the variables (Hatcher 2013). In the conducted research the task of the determined analysis was a quantitative assessment of influence of each factor on a productive indicator.

3. Results and discussion

According to Syzdykov *et al.* (2015), the structure of agricultural agents in Kazakhstan is divided into the large agricultural enterprises, peasant farms and household farms. The main share of production of livestock sector

in Kazakhstan is produced in peasant farms and household farms. Thus, the livestock sector in the Republic depends more on personal subsidiary farms where generally there is no possibility to use of high-performance equipment, new technologies, on the contrary manual extensive and unproductive skills are used. Household farms, as a rule, breed a small stock of animals. However, the livestock sector in Kazakhstan is one of primary sector in agriculture of Kazakhstan. According to latest statistical data (Committee on Statistics 2015) the vast pasturelands and favorable climatic conditions create a good basis for the development of livestock sector. In animal production, the number of animals and poultry, except for pigs, demonstrated a stable growth. From 2004 to 2015 the number of cattle has increased by 12.4%, sheep by 34.6%, goats by 11.3%, horses by 59.2% and poultry by 33.4%. Significant increase in a share of production in production structure in 2014 in comparison with 2004 is observed in production of poultry meat. Unlike other sectors production of poultry in Kazakhstan consists of major industrial production by the agricultural enterprises and minor production by household farms.

Wieck *et al.* (2014) described that during the Soviet period in Kazakhstan worked 80 poultry state owned farms, which produced annually ca. 3.5 million eggs and 150 thousand tons of poultry meat. After the year 1990 the bird livestock in Kazakhstan was sharply reduced. By the year 2000 the crisis was overcome and the gradual growth of a livestock of a bird began. However, in process of revival of the large poultry-breeding enterprises, which kept production base with the closed production cycle and developments of poultry breeding in the private sector, the main driving forces come from governmental incentives not from market forces. The sharp rise in the production was observed in the years 2000-2002 and 2006-2009. In recent years, the livestock of poultry birds in Kazakhstan increases up to ca. 38 mln heads in 2014 (Yesbolova *et al.* 2015a).

In order to strengthen the development of the poultry industry in Kazakhstan there was elaborated, agreed and implemented the national “Master Plan for poultry meat sector development till 2020”. In this Program the priorities of gradual import substitution and providing the population with a qualitative domestic production are defined. Implementation of the Plan will allow supplying the domestic market with the poultry meat from the domestic production more than in 80% (Ministry of Agriculture 2015). In the Plan are defined also the basic provisions of perspective economic policy of country. In particular, increase of a role of the state in formation of the effective competitive environment by means of customs and tariff and non-tariff regulation of import; antimonopoly regulation of the market of poultry production and the resources; financing of structural and technological modernization; innovative development of material and technical resources by means of increase in scope of the subsidized interest rates for the credits and other financial support of the agricultural enterprises. The huge part in implementation of the Plan is assigned to distribution of the best practices of application and management of new technologies.

The analysis of the governmental Plan shows its piecemeal approach. Firstly, there is a focus on meat production, while the egg production is not taken into consideration. Secondly, the focus is paid only on one side of the market – supply, with a special emphasis on the primary production and processing, thus, the whole supply chain, especially intermediaries and trade, are not taken into consideration. Finally, it focuses only on development on a kind of fixed elements of the system, while not mentioning the importance of institutions, knowledge and information that creates rules of the system functioning (assuming free market economy).

According to several authors (*i.e*. Smykov 2009, Larsson 2009, and Yesbolova *et al.* 2015b), there are significant limitations of the growth of the poultry heads. A part from disintegration of the Soviet Union and the large-scale import dependence, important factor is availability of the fodders. It is argued that existing compound feed producers in the Kazakhstan do not meet the quality standards required by the poultry plants, and so most of the plants have installed and are operating their own feed production capacities. According to Yesbolova *et al*. (2015c), there are 33 compound feed mills in the Republic of Kazakhstan, only two of which are registered as medium-sized or large enterprises. The remaining enterprises focus on the production of flour and baked goods. The dynamics of main economic indicators of poultry industry in Kazakhstan in the period 2010-2015 are presented in the Table 1.

Table 1 – The dynamics of main economic indicators of poultry sector in Kazakhstan in the years 2010-2015

Indexes	2010	2011	2012	2013	2014	2015	Rate of change 2015 to 2010, %
Poultry meat production, thousand ton	103.0	102.0	123.1	135.8	134.2	146.1	141.8
Egg production, million pieces	3,720.3	3,718.5	3,673.4	3,896.0	4,291.2	4,737.0	127.3
Average exit of eggs to one chicken layer, pieces	215.0	214.0	213.0	220.0	225.0	234.0	108.8
Specialization of the agricultural enterprises, %	55.2	58.1	60.9	62.6	62.7	62.9	113.9
Average annual retail prices for poultry meat, kg/tenge	403.0	457.0	481.0	501.0	521.0	532.0	132.0

Source: own calculations based on the data from Committee on Statistics of Ministry of National Economy of the Republic of Kazakhstan

Table 1 indicates that poultry meat production during the period 2010 - 2015 increased by 41.8% or 43.1 thousand tons, and production of eggs by 27.3%. According to Committee on Statistics, the average consumer price for poultry meat by results of 2015 amounted to 532 tenge per kilogram. At the same time, in 2015 there is an increase of the price of poultry meat compared to the same period of the previous year from 521 to 532 tenge per kg. The reason of increase is high prices for compound feeds. As compound feeds in the cost structure of meat production take 65%. Average exit of eggs to one chicken layer for the studied period is increased by 8,8% or 19 pieces. It should be noted that in the developed countries by means of the balanced feeding efficiency of a bird reaches 290-310 eggs/year. In the future, it is necessary to pay attention to increase in compound feeds of own preparation that will provide minimization of costs of production of poultry farming at her maximum exit.

For the analyzed period, specific weight of the specialized poultry enterprises increased from 55.2 to 62.9% that demonstrates growth of level of specialization and concentration of production in poultry sector. The higher level of specialization and concentration of production, the economic efficiency of poultry farms in Kazakhstan is higher too. This is mostly due to the fact that in specialized poultry farms it is possible to use special equipment and technologies and to invite highly qualified specialists.

From the point of view of future development, it is important also to raise a question about the possible channels of meat and eggs distribution (Schmitz and Meyers 2015). The answer might come from the results of the research of DAMU Research Group (2014), which conducted in 2014 a unique and representative census of the prices on separate types of poultry products in all 16 regions of Kazakhstan, incl. regional centers and cities. In each region data were collected from 5 various outlets, namely: big grocery supermarkets, small grocery departments in supermarkets, minimarkets, small separate shops and the markets. It was found that the minimum difference on maximum and minimum prices is observed on laying hens - by 1.8 times (the price fluctuates from 2.57 to 4.67 US dollars/kg), chicken fillet – by 1.9 times (from 3.20 to 6.0 US dollars/kg), on semi-carcasses or quarter timbers with a bone - twice (from 2.0 to 4.0 US dollars/kg) and chicken legs (ham) - from 2.20 to 5.07 US dollars/kg, or by 2.3 times. The analysis of the Table 2 shows that now the prices of the main products of poultry industry significantly differ from the prices in other formats of trade. This fact might lead to the conclusion that over time the population will prefer to do the purchases of poultry meat in supermarkets.

Table 2 – Price analysis of different types of poultry products in Kazakhstan marketed by different shopping units

Shopping unit	Price, US dollar	Poultry eggs, 10 units	Quail eggs, 10 units	Dressed chicken, kg	Laying bird,kg	Chicken cutting without bone (fillet), kg	Semi-carcasses or quarter timbers with a bone, kg	Chicken legs with a bone, kg	Chicken giblets, kg
Big grocery supermarket	Minimum	1.17	1.00	2.34	2.57	3.20	2.50	2.53	2.06
	Maximum	1.67	3.67	5.87	3.74	6.00	4.00	4.87	8.00
	Average	1.42	2.34	4.11	3.16	4.60	3.25	3.70	5.03
Small grocery department in store	Minimum	1.00	1.67	1.67	3.40	4.00	2.47	2.67	2.54
	Maximum	1.87	1.74	4.20	3.47	6.00	4.00	5.07	5.67
	Average	1.44	1.71	2.94	3.44	5.00	3.24	3.87	4.11
Minimarket	Minimum	0.87	1.34	2.20	3.30	4.00	2.27	2.20	2.67
	Maximum	1.67	3.00	6.40	4.67	5.67	2.50	5.07	5.34
	Average	1.27	2.17	4.30	3.99	4.84	2.39	3.64	4.01
Market	Minimum	0.87	1.67	2.47	3.40	4.00	2.00	2.44	2.34
	Maximum	2.34	1.74	4.00	3.67	6.00	4.00	5.00	5.80
	Average	1.61	1.71	3.24	3.54	5.00	3.00	3.72	4.07
Stall	Minimum	1.00	1.07	2.80	3.27	4.00	2.60	2.60	2.67
	Maximum	1.80	1.74	4.67	3.54	5.00	4.00	4.80	5.34
	Average	1.40	1.41	3.74	3.41	4.50	3.30	3.70	4.01

Source: own elaboration

Also, there was used a multiple regression analysis (similarly as applied previously by Gataulin *et al.* 1990) to forecast the scale of the development of the poultry sector in Kazakhstan. The task of the determined analysis was a quantitative assessment of influence of chosen factor on a productive indicator. For multiple regressions, there were selected following factors:

$\acute{y}$ - Production of poultry meat, total, thousand ton;
x_1 - Total poultry numbers, million birds;
x_2 - Specialization of the agricultural enterprises, %;
x_3 - Average annual retail prices for poultry meat, 10 kg/US dollars;
x_4 - The average mass of the realized bird, kg;
x_5 - Average daily gain, gram;
x_6 - Costs of 1 center of a gain, center of fodder unit.

As a result, the multiple regression equation has shown:

$$y = 403{,}459 + 5{,}01_{x1} + 0{,}83_{x2} - 64{,}75_{x3} + 222{,}67_{x4} + 0{,}33_{x5} + 8{,}91_{x6}, \qquad R = 0.9967$$

Based on the results of the factorial analysis where the value of multiple determination coefficient is R^2 = 0.9967 *i.e.* 99.6% shows to very high degree of variation conditionality of the result by a variation of factors, that is - to very close connection of factors with result.

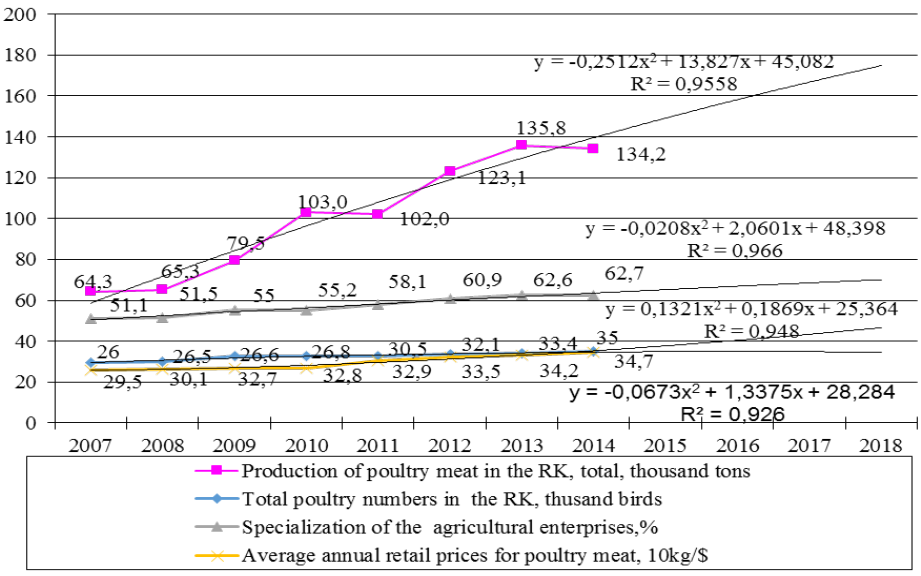

Figure 1 – Trend models of poultry meet sector development until 2018. Source: own calculations based on the data from Committee on Statistics of Ministry of National Economy of the Republic of Kazakhstan

Comparing values of determination R^2 for calculation of the projected values of number birds in Kazakhstan on the future it was necessary to use the polynomial equation, $0{,}0208_{x2} + 2{,}0601_x + 48{,}398$ where $R^2 = 0.966$ (see Figure 1).

The trend equation $0{,}1321_{x2} + 0{,}1869_x + 25{,}364$ where $R^2 = 0.948$ shows the projected values of specific weight of specialized poultry agricultural enterprises in the total amount from poultry-farming enterprises in the future.

Analyzing the values of R^2 on the different equations of trends it was determined that for calculation of the projected values of the average annual retail prices for poultry meat in Kazakhstan in the future one should use the equation $0{,}0673_{x2} + 1{,}3375_x + 28{,}284$, where $R^2 = 0.926$.

The values of coefficients of pair correlation indicate very close connection of poultry meat output *y* as with numbers of birds in the country - x_1 and with the specific weight of the specialized agricultural enterprises - x_2($r_{yx1} = 0.9274$ and $r_{yx2} = 0.9749$). But at the same time interfactorial communication $r_{x1x2} = 0.9367$ very close also exceeds neighboring relationship of x_2 with y.

The multiple regression analysis show, that using classical economic approach to the poultry sector development in Kazakhstan in the mid-term perspective there is close relationship between variables taken into consideration in the analysis, namely: production of poultry meat, total, thousand tons; total poultry numbers, million birds; specialization of the agricultural enterprises and average annual retail prices for poultry meat. It showed that there is expected in a very high degree of variation conditionality of the result, that there will be ensured a balanced growth.

Conclusion

Poultry production in Kazakhstan is recognized as a promising and strategically important sector for ensuring the country's food security. Despite increase in production and considerable investments into poultry industry, Kazakhstan still remains dependent on import of poultry production - more than a half of the consumed production is imported to the country.

The analysis of the received results of processing of the questionnaire shows that the prices of the main products of poultry farming significantly differ from the prices of different forms of trade, and over time the population will prefer to do the purchases in supermarkets. And also for successful functioning on a sales market of fowl necessary to create distributor networks with the developed transport infrastructure.

The conducted research shows that in general poultry industry in Kazakhstan is a perspective sector. In mid-term perspective, this sector should be developed in a complex way. On one hand, the production (supply) side should be enlarged and modernized, especially through economics of scale and specialization. On the other, the demand side should be developed too, where special attention should be paid on price levels and distribution channels.

Nonetheless it needs to be remembered that technological and economic incentives might not bring expected results, if the institutional factors will not be implemented too. This is especially important with regard to market information, which should be used to reduce the production and trade risk under the conditions not only of national but also global competition.

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Foreign Capital Inflows, Institutional Factors and Economic Growth. Evidences from Republic of Yemen

Abduarhman SALIM ABDUALLAH BAHATTAB
School of Economics, Finance and Banking
College of Business, University Utara Malaysia
as_ba_ye@yahoo.com

Muhammad AZAM
Department of Management Sciences
Abdul Wali Khan University Mardan, KP- Pakistan
drazam75@yahoo.com

Laura GAVRILĂ
Faculty of Juridical, Economics and Administrative Sciences, Craiova
Spiru Haret University, Romania
laurastef73@gmail.com

Chandra EMIRULLAH
Public Finance Polytechnics, STAN Jakarta-Indonesia
cemirullah@yahoo.com

Abstract

The present study attempts to explore the effect of foreign capital inflows (i.e., Foreign Direct Investment (FDI), workers' remittances and foreign aid), on economic growth for Republic of Yemen. We also examine the role of corruption and political stability whether these factors have any impact on foreign capital inflows between 2003 and 2014. The empirical results reveal that FDI inflows have a positive and significant effect, while workers' remittances have insignificant impact on Yemen's economic growth.

However, results on the impact of corruption and political stability on economic growth are statistically insignificant. The findings of the study suggest some policy implication, i.e. FDI and remittances need to be enhanced, while corruption needs to be controlled and political stability be sustained in order to achieve sustainable economic growth and development.

Keywords: foreign capital inflows, institutional factors, Republic of Yemen.

JEL Classification: D7, F2, N15.

1. Introduction

Every state intends to achieve a higher level of economic growth and thereby improve social welfare. Therefore, they look for ways to expedite the process of growth and economic development. In this regard, the role of Foreign Capital Inflows (FCI) in the process of economic growth and development cannot be overlooked particularly incoming FDI and remittances. Although, there are arguments about the effect of FCI on the economic growth in developing countries, many research scholars opine that the components related to FCI affect the domestic savings and economic growth negatively in the developing countries especially where there are poor policies (Boone 1994, Enos and Griffin 1971, Khan *et al.* 1992, Papanek 1973). However, FCI serves as one of the ways to support GDP just like the empirical assessment of importance of FCI to growth of economy in some host countries (Balasubramanyam *et al.* 1996, Borensztein *et al.* 1998, Makki and Somwaru 2004). There is a widely shared view that FCI fosters host countries growth by raising domestic savings and then transferring technology from abroad. Moreover, FCI can increase competition in the host country's domestic market; and lastly, increase exports due to increase of foreign exchange flow to the economy at large (Hsiao and Shen 2003). According to Kim *et al.* (2007) in a convention, the developing countries welcomed FCI to fill the space existing between domestic savings and investments to promote economic growth. However, some other studies have been criticized based on general view that FCI hinders mobilization of economic growth and that of domestic savings.

Fundamentally, all developing countries are poor; hence they have lower income due to lower saving and investment. Consequently, lower income leads to lower taxable capacity leading to low government expenditure. Therefore, countries struggling to develop need to depend on FCI to make up for deficits in investment-saving and balance of payment. Therefore, the developing countries need FCI for their development. For a number of developing regions, the study of Driffield and Jones (2013) finds that the impacts of FDI inflows and remittances

are encouraging as they largely stimulated economic growth during 1984-2007 based on unbalanced panel which contains 5-year average. The study also observes that the foreign aid (official development assistance (ODA)) has a negative effect on growth. However, the level of assistance from foreign economy is at variance from one country to another. The size and conditions of the economy of a country are the main factors that affect the amount and structure of FCI in a specific country, other studies find negative effects on some countries, (Orji *et al.* 2014). The empirical results of Azam (2015) support the presence of positive and significant relationship between remittances and economic growth for four Asian countries namely Bangladesh, Pakistan, Sri Lanka, and India during 1976-2012. Tahir *et al*. (2015) find that incoming FDI and foreign remittance have significant positive roles in the process of growth of Pakistan using data over the period 1977-2013. In a recent study, Azam *et al*. (2016) finds that both FDI inflows and foreign remittances are important sources of economic growth for 12 countries from Europe and Central Asia during 1993–2013.

Abdouli and Hammami (2015) investigate the relationship between FDI inflows, quality of environment and economic growth of capital stock across 17 countries from Middle East and North African (MENA) including Yemen during 1990-2012. The empirical results indicate that an increase in incoming FDI and capital stock promotes the process of economic growth in MENA countries. However, in particular, FDI inflows to Yemen have insignificant impact on economic growth.

Similarly, the role of the institutional factors is highly indispensable for the economic growth and development. The study of Mauro (1995) observes corruption and investment have a negative association and thereby affect negatively economic growth. Catrinescu *et al*. (2009) find that institutional environment covering political stability and corruption is affecting volume and effectiveness of investment. Moreover, remittances can be done in a more efficient manner in the presence of good institutions and therefore get a high result in return. Aisen and Veiga (2013) suggest that a higher degree of political instability is associated with lower growth rates of GDP per capita. Azam and Emirullah (2014) also find that high cost of doing business and inequality due to high corruption lead to a decrease in investment and at the end have a negative impact on economic growth.

According to Haan (2014), there are a lot of challenges to economic development in the future of Yemen economy. Instability in politics continuously affects all sectors in the government alongside challenges of security. In addition, there are tough economic issues and political challenges in Yemen. Political stability plays an important role and positively affects FDI inflows and the growth of economy in Yemen (Musibah*et al.* 2015).

The statistics show that the highest component of FCI to Yemen is workers remittances during 2003-2013 then followed by ODA and FDI respectively. Remittances achieved the highest amount, more than USD 3.3 billion in 2012. Also, ODA reached around USD 1 billion in 2013 and the highest magnitude for FDI was in 2008, almost USD 1.50 billion. The most shocking aspect of the issue is FDI which started by a negative value in the period under study and also has continued in the negativity since Arab spring in 2011. However, FCI in FDI form fluctuated over the period under this study although the best period for FDI to Yemen in the period between 2006 and 2008. On other hand, ODA increased slowly and worker remittances rose sharply from 2011 (World Development Indicators 2015).

The Republic of Yemen has relatively allowed level of income due to low savings and investments and thereby lower revenue of the government. Consequently, government is not in a good position to have more resources for the development of Yemen. In a study,Casper (2014) mentions that the present condition of poverty in Yemen is a result of high level of corruption in the system of politics. Researchers have shown that Yemen is a country which is continuously politically corrupt on a large scale and multitude of levels. Therefore, the present study is an effort to explore the relationships between FCI and economic growth, while considering the role of institutional factors namely corruption and political stability. This study is different in terms of the portfolio of explanatory variables, time period and methodology. It is expected that outcomes of the study will guide policy makers of Yemen.

The remaining study is organized as follows: Section 2 deals with data and empirical methodology used in the study. Section 3 interprets the empirical results. Section 4 concludes the study.

2. Data and empirical methodology

Annual time series data over the period ranging from 2003 to 2014 are used in this study and taken from the World Development Indicators (2015). Data sources and variables definition are given in Table 1. A brief summary of the descriptive statistics is presented in Table 2.

To examine the relationship between FCI (FDI, remittances, ODA) and institutional factors (corruption and political stability) on the economy of Yemen, the following growth equation is to be used and can be expressed as:

$$RGDP_t = \beta_0 + \beta_1 FDI_t + \beta_2 ODA_t + \beta_3 PR_t + \beta_4 CP_t + \beta_5 PS_t + \mu_t \quad (1)$$

where: $RGDP_t$= Real Gross Domestic Product, FDI_t = Foreign direct investment inflows, ODA_t= Net official development assistance and official aid received, PR_t= Personal remittances received, CP_t = Corruption perception Index, PS_t = Political stability Index, β_0= Constantterm, μ= Error term, β_1 to β_2 = the coefficients for the variables

FDI is included in the model because several studies find that it has a large and robust relationship with economic growth (Aizenman *et al.* 2013, Azam and Ahmed 2015, Azam and Gavrila 2015). Remittance inflow contributes positively to economic growth (Catrinescu *et al.* 2009, Driffield and Jones 2013). The impact of ODA on economic growth is yet controversial because some studies observe positive (Lessman *et al.* 2012), while the other find negative impact of ODA on economic growth (Azam 2014). Likewise, institutional factor corruption affects negatively economic growth (Kunieda *et al.* 2014), while political stability has a positive impact on FDI and economic growth (Catrinescu *et al.* 2009, Musibah *et al.* 2015).

Table 1 - Data sources and variables definition

VARIABLE	DEFINITION	SOURCE
RGDP	Real GDP (2005 constant USD)	World Development Indictors (WDI) (2015) the World Bank database
FDI	Net inflows FDI to Yemen.	
ODA	Net Official Development Assistance and Official Aid Received.	
PR	Personal Remittances, Received	
CP	Corruption Perceptions Index level of public sector corruption on a scale of 0 (highly corrupt) to 10 (very clean).	Transparency International Organization (2015) https://www.transparency.org/
PS	Political Stability: Estimate of governance (ranges from approximately - 2.5 (weak) to 2.5 (strong) governance performance	World Wide Governance Indicators (WGI) (2015) the World Bank database

Table 2 - Summary of descriptive statistics

Variables	Mean	Max.	Mini.	Std. Dev
RGDP*	17583.9322	19989.0809	15260.3089	1406.4386
FDI*	273.0000	1554.6300	-518.0000	645.0000
PR*	1690.0000	3342.5000	1160.0000	823.0000
ODA*	471.0000	1003.5300	242.5600	823.0000
CPI	2.3300	2.7000	1.8000	2.7000
PS	-1.9300	-1.3000	-2.4000	0.4500

Note: * US$ Million

3. Regression results

Based on the nature of the data, this study is using the method of Ordinary Least Squares (OLS) for parameter estimation. OLS is a famous technique in regression model as it demonstrates strong theoretical properties known as the Gauss-Markov theorem. Some other studies also employed the OLS as an analytical technique for parameters estimation (Baldi and Miethe 2015, Orji *et al.* 2014). OLS estimates are given in Table 3, overall, the empirical results are satisfactory where the adj. R^2 shows more than 70% of the variation is explained by the explanatory variables. The impact of FDI is significant at 5% level, so FDI has positive impact on real GDP of Yemen. This positive result of FDI reveals that there exist natural resources and space in Yemen, creating employment and improving the technology. The estimated coefficient of FDI shows that one unit increase in FDI inflows will bring 1.12 unit increase in the real GDP of Yemen (Table 3, column 1). These results are in accordance to the findings by Orji *et al.* (2014) and some others. ODA and economic growth has a positive relationship and is significant at 5% level. The results reveal that one unit increase in ODA will increase economic growth by 9.73%. However, the impact of remittances on economic growth is found statistically insignificant and with unexpected negative sign. These results imply that perhaps the recipients use remittances for consumption and for caring old parents and children who do not have any positive contribution to economic growth of Yemen. Our results are in line with the prior studies including that of Orji *et al*. (2014).

The data demonstrate that there is a higher level of correlation between corruption and political stability and this correlation level is above 85%. When political stability only is introduced as an explanatory variable, the

correlation level is found significant and has negative impact on economic growth but the R^2 value is less than 35%. When only corruption is regressed as an explanatory variable, it is found to be statistically significant at 10% level and has a negative impact on economic growth but the R^2 value is less than 30%. However political stability and corruption do not have any statistically significant strong effect on economic growth of Yemen during the period under the study. Ghoneim and Ezzat (2014) mentioned the *"greasing the wheels"* hypothesis that corruption may boost growth in the existence of weak regulation. While at very high levels of regulation a decrease in the level of corruption will have a positive impact on growth. In the context of the economy that has attracted FDI but has weak regulation such as Yemen, this finding is not surprising. The corruption in the form of giving bribery, for example, that exists in the country may have made doing business in the country easier for investors, for example, in getting business licenses, instead of following the formal procedure that can take a long time.

Table 3 - OLS estimates

VARIABLES	1	2	3	4
	Coeff.	Coeff.	Coeff.	Coeff.
FDI	1.1263** (0.022) [3.243]	1.0309** (0.035) [2.608]		
ODA	9.734** (0.020) [3.324]	8.076*** (0.002) [4.750]		
PR	-1.745** (0.0192) [3.404]	-1.555** (0.016) [3.119]		
CP	-362000 (1.368) [1.830]		-273000* (0.099) [1.834]	
PS	-159000 (0.1552 [1.673]			-187000*** (0.0000) [8.467]
Intercept	417000 (1.268) [0.690]	161000*** (0.0000) [26.048]	23900*** (0.0001) [6.868]	140000*** (0.000) [8.467]
R^2	0.887	0.790	0.272	0.356
adj. R^2	0.775	0.700	0.191	0.284
F- statistic	7.901	8.795	3.366	4.979
Prob. (F-statistic)	0.020	0.008	0.099	0.052

Note: Prob. values and t-ratios are given in ( ) and [ ] respectively. Asterisks *, ** and *** shows significant level at 1%,5% and 10% respectively.

4. Conclusion and policy recommendations

The aim of the present study is to evaluate the impact of FCI on economic growth in Republic of Yemen over the period 2003-2014. Additionally, it examines the effect of institutional factors namely corruption and political stability on Yemen's economic growth. The OLS shows that FDI inflows and ODA have positive impact on the economic growth, while workers' remittances have a negative impact on economic growth. Similarly, the effect of institutional factors, corruption and political stability are found statistically weak.

However, these results have some important policy implications. Policy makers need to create sound environment to attract more FDI into the country. The FDI can be utilized to enhancing domestic production, and volume of exports. It will help in increasing the use of new technology and learning and also provide access to external market. The government should speed up the improvement of infrastructure which is an important factor for attracting foreign investors. The government of Yemen needs to encourage the local industries and reduce imported goods. However, consuming local products may reduce the negative impact of personal remittances or may change it to positive effect in future which will lead Yemen to get positive balance trade. Indeed, Yemen needs a business environment which is conducive to the needs of businesses. In general, foreign investors don't look for fiscal concessions or special incentives but they look for investor-friendly official procedures, rules and regulations, clearance, no corruption, political stability and opportunities in Yemen. In fact, this can be achieved only if Yemen implements its new generation of reforms in totality and in right direction.

In light of current situation in Yemen, the role of political stability including security cannot be taken for granted, however. It will increasingly become an important factor in order to create a conducive environment to attract more FDI and hence promote economic growth. Thus, the leaders and policymakers should make every effort to create political stability and good governance as well as secure and peaceful condition and situation to establish sound investment climate in the country.

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Improving the Efficiency of Socio-Economic Development of Mono-towns in the Republic of Kazakhstan based on the Development Strategies

Lesbek TAIZHANOV
A.Yassawi International Kazakh-Turkish University, Turkistan, Kazakhstan
taizhanov1988@mail.ru

Ulmeken MAKHANBETOVA
A.Yassawi International Kazakh-Turkish University, Turkistan, Kazakhstan
maxan_ulmeken@mail.ru

Borash MYRZALIEV
A.Yassawi International Kazakh-Turkish University, Turkistan, Kazakhstan
borash2006@mail.ru

Gulmira AZRETBERGENOVA
A.Yassawi International Kazakh-Turkish University, Turkistan, Kazakhstan
gulag@mail.ru

Ainura SAPAROVA
A.Yassawi International Kazakh-Turkish University, Turkistan, Kazakhstan
saynura1977@mail.ru

Abstract:

Due to the potential threat of socio-economic crisis and degradation of single-industry towns in the Republic of Kazakhstan, the purpose of the article is to develop a conceptual approach to the formation of optimal development strategies of mono towns considering the level of their current socio-economic development. Method for contrast of means was the methodological basis of the study which allowed revealing direct proportion of social and economic development trends in mono towns as of 2015. Using expert method, we have formed a sample to determine the integrated index of social and economic development of mono towns and on the basis of principal component analysis we have established the extent of their influence on the intensity of their development. Using matrix approach mono town were differentiated by strategic areas of their socio-economic development in the modern conditions. Matrix of ongoing socio-economic development directions of mono towns was formalized during the study, differentiating territorial entities according to their level of socio-economic development as of 2015. The proposed strategies reflect a new approach in the system of strategic management of regional development, since it is based on the peculiarities of the actual development of mono towns in direct proportion to the levels of mono towns' socio- economic development.

Keywords: development strategy of mono towns, matrix of socio-economic development strategies, mono towns, socio-economic development efficiency.

JEL Classification: P35, R13, G38.

1. Introduction

Stable economic development of a country is provided by a stability of the regional system, the basic structural element of which is cities. Reforming and development of the economy of the Republic of Kazakhstan facilitated the emergence of a special category of cities, the so-called single-industry towns (mono towns). Currently 27 cities out of 86 operating cities in the country have the status of a mono town– almost every third city with a total resident population constituting 16.8% of the country's urban population (Ministry of National Economy of the Republic of Kazakhstan 2015). In modern conditions, economic development of mono towns in the Republic of Kazakhstan is characterized by the outdated structure of regional production, high level of depreciation of equipment, networks and systems, low level of qualification of employed population, weakness of the local budgets. The basis of mono town is local economic mainstay, forming non-diversity of such settlements, which, in turn, cause dependence of all spheres of livelihood of the population on the economic situation of the company and its financial and economic results. With the growth of mono town population over the past decade by 150% in parallel with the decline in industrial production by 15% and decreasing level of investment in fixed assets by 36% as of 03.01.2016, the potential threat of socio-economic crisis and social degradation of environment in these territorial entities is forming (Ministry of National Economy of the Republic of Kazakhstan 2015).

2. Literature review

State concept of improvement of the efficiency of monotowns in the Republic of Kazakhstan (RK) is based on the uniformity of monotowns development in regions that caused complete inefficiency of the implementation of the state policy. RK monotowns are not uniform and are divided into several types depending on local economic mainstay prospects and urban economy potential. In this regard, the state policy in reference to monotowns should be based on a differentiated approach to the formation of strategic development of settlements of various types. Differentiated policy will contribute to more efficient use of public funds that, in turn, will determine the ability of capacity formation for sustainable socio-economic development of monotowns in the Republic of Kazakhstan. Interpreting the urgent need and relevance of scientific research in the field of socio-economic development of monotowns, this study is aimed at elimination of identified short comings as a qualitatively new dimension in methodology of improving the efficiency of socio-economic development of the territorial entities.

Analysis of economic literature suggests fundamental elaboration of scientific problems – improving the efficiency of socio-economic development of regions, in particular, monotowns.

The concept of "monotown" is characterized by unambiguous wording of its essence by scientists and reflects the specific form of urban settlement based on non-diversified company towns (Amanbekov 2015, Fritz and Koch 2016, Lenkova *et al*. 2014, Nikulina and Khomenko 2015).

Theoretical and methodological basis of management of socio-economic development of monotowns is one of the key issues in the theory of discussion of modern scientists. Most of approaches focus attention on distinguishing the factors affecting the competitiveness of monotowns, widely using SWOT and PEST analysis tools (Cvetkova 2013, Krasavin and Krasavina 2015, Malganova and Zagladina 2015, Myrzaliev 2013). This area of research is fundamentally developed, but only limited to the identification of positive and negative factors of monotowns development, without taking into account peculiarities of monotowns functioning and their modern condition.

Also, many studies focus on evaluating the efficiency of monotowns at the present stage of their development (Anchorena and Anjos 2015, Cheymetova and Nazmutdinova 2015, Goschin 2015, Kaufmann 2016). Methods of economic-mathematical modeling received a broad dissemination in this research field, the main ones are: regression analysis and hierarchy analysis technique (Marconi *et al.* 2016, Palevičienė and Dumčiuvienė 2015, Shastitko and Fakhitova 2015, Leksin 2015). The advantage of this approach is a quantitative assessment of socio-economic development of monotowns, allowing accurately understanding the current status and development potential of territorial entities (Cegarra-Navarro *et al*. 2016, Malganova and Zagladina 2015, Vertakova *et al*. 2015, Yushkov 2015). Meanwhile, as evidenced by the analysis, these studies do not take into account the interdependence of social and economic development of monotowns, as complementary components of effective functioning at the macroeconomic level.

Particular attention should be paid to the research on formulation of strategic directions of monotowns development, the main ones are: high-tech development of monotowns; ensuring the intensity of the economic and social spheres development; transition to a rotational method to organize the work in local economic mainstay (Dobrovičová *et al.* 2015, Kryukova *et al.* 2015, Leonard *et al.* 2014, Rusu-Tanasă 2015, Wolf 2013). This group of scientific research is based on the development of common strategies for urban development, on the assessment of the efficiency of public financing and improving the efficiency of local economic mainstays (Cowell 2013, Dubnitskiy and Lunina 2015, Kuznetsov and Strijov 2014, Marcin 2013), without taking into account the diversification of the regions according to their current level of socio-economic development.

Referring to the shortcomings of conceptual approaches to resolve problems of this science field, the aim of the study was an attempt to develop a conceptual approach to the formation of optimal development strategies of monotowns on example of the Republic of Kazakhstan. The presented scientific opinion is based on a differentiated approach to the current state of socio-economic development of territorial entities and accounting complementary effect of social and economic development of monotowns.

3. Analytical review

Territorial entities – monotowns have strategic importance for the socio-economic system of Kazakhstan, as they focus a significant part of the industrial potential of the country's economy and they consist of more than 16% of urban population. The peculiarity of monotowns is a close link between the functioning of urban settlement and large local economic mainstays, which leads to the need to ensure sustainability of their development. As the analysis showed, the social sphere in Kazakhstan monotowns reflects the strong negative trend. The rate of population growth during 2010-2015 decreased by 33%, while the index of real wages decreased by 19% (Figure

1) (Ministry of National Economy of the Republic of Kazakhstan 2015). As of 2015 the average salary in monotowns was 117,529 tenge, which is 7 times less than in other cities of the Republic, furthermore in the majority of territorial settlements wage level does not exceed 65,000 tenge.

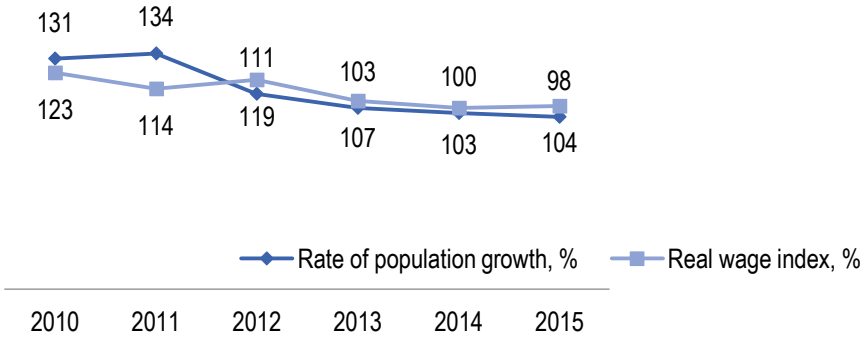

Figure 1– Dynamics of social sphere development indexes in RK monotowns

The low level of income of the population contributed to the low level of quality of life in monotowns. This situation is caused by a constant decline in production in urban areas (industrial production index decreased by 27% in 2010-2015) accompanied by a decrease in the volume of investment in fixed assets by 22%, and a significant reduction in the level of self-employment (*e.g.* retail level dropped by 32% as the dominant form of self-employment in RK monotowns) (Figure 2) (Ministry of National Economy of the Republic of Kazakhstan 2015). In turn, this trend leads to reduction of occupational level, reduction of the tax base to local budgets of monotown, and therefore, the reduction of social benefits, which forms the threat of social tensions. Moreover, against the background of underdeveloped infrastructure of monotowns, an active migration of the population in other towns of Kazakhstan is observed.

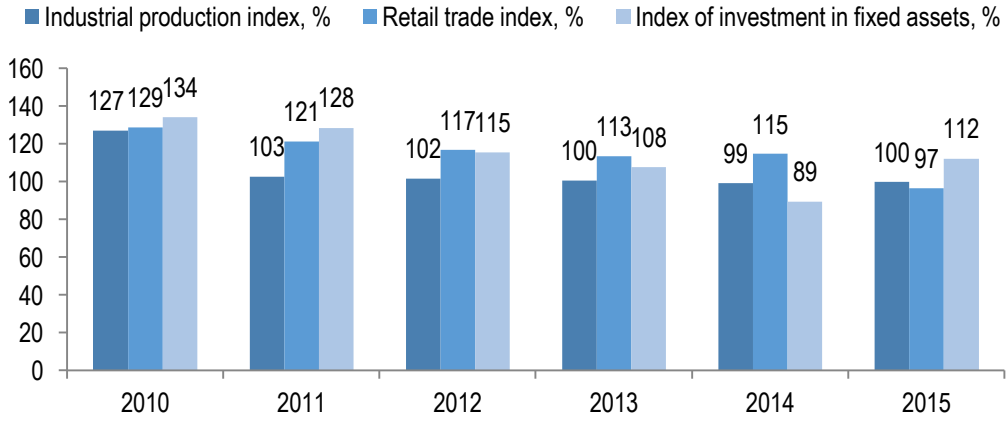

Figure 2 – Dynamics of economic sphere development indexes in RK monotowns

"Monotown Development Program for 2012-2020" has been adopted to solve the problems of monotowns in Kazakhstan. The aim of the concept is to ensure sustainable socio-economic monotown development in the medium and long term. One of the main factors of inefficiency of the program was the fact that the strategic actions for ensuring the development of monotowns were based only on the identification of the economic potential of the regions, without relying on the current state of their socio-economic development. In addition, it had the general non-regulatory nature, without a differentiated approach to the actual level of socio-economic development of the territorial entities. As a result, financed activities did not give significant results within the framework of socio-economic modernization of monotowns and currently the program did not find practical reflection and was eliminated. In view of the foregoing, the aim of this study is to develop a conceptual approach to the formation of monotown development strategy on a case-by-case basis considering their current state and complementary processes of modernization of social and economic development.

4. Results

With the aim to develop a strategy for socio-economic development of Kazakhstan monotowns, adequate to modern conditions of their development and existing potential during the study we developed an approach allowing identifying priority areas of monotown development in accordance with the diversification of their level of economic and social development. The study examined 26 monotowns out of 27 due to a lack of reliable statistics relating to Serebryansk.

Research methodical approach was the formation of matrix "index of economic development of a monotown" – "index of social development of a monotown". The matrix is a model of social development dependence on the economic development of a monotown in modern conditions.

The object of study is the interaction between economic development and social development of RK monotown, as a factor of not only quantitative changes but qualitative changes in complementary sectors of territorial entities causing socio-economic modernization of cities as well.

Strategic development matrix is based on the assumption that a monotown has a high index of socio-economic development; as a result of growth in industrial production and investment in fixed assets, increase in diversification of production in the region, population wage rates in the city are increasing, which in turn increases the rate of population growth. If this hypothesis is performed, it serves as criteria for distinguishing of four monotown classification groups corresponding to different priority strategic objectives and financial needs:

- development despite growing negativity (high level of social development/low level of economic development);
- medalists (high level of social development/level of economic development);
- contradiction (low level of social development/level of economic development);
- catastrophe (low levels of social development/low level of economic development).

Sample of statistical indicators of socio-economic development of Kazakhstan monotowns was established on the basis of sociological survey. Total number of respondents was 300 people – employees of JSC "Economic Research Institute" of the Ministry of Economy and Budget Planning of the Republic of Kazakhstan. During the survey the experts were asked to put the importance of each indicator on a scale from 0 to 10 in assessing the level of social and economic development of Kazakhstan monotowns. According to the survey, the index of dispersion of each indicator was calculated, *i.e.* the extent of its impact on the level of socio-economic monotown development:

$$\sigma^2 = \frac{\sum(x_i - \bar{x})^2}{n}, \quad (1)$$

where x is an expert evaluation of n - indicator significance; $\overline{x}$ – an average expert evaluation of the indicator significance; n – a number of indicators.

The impact of the most significant indicators on the level of social and economic development of Kazakhstan monotowns is presented graphically in Figures 3 and 4, respectively.

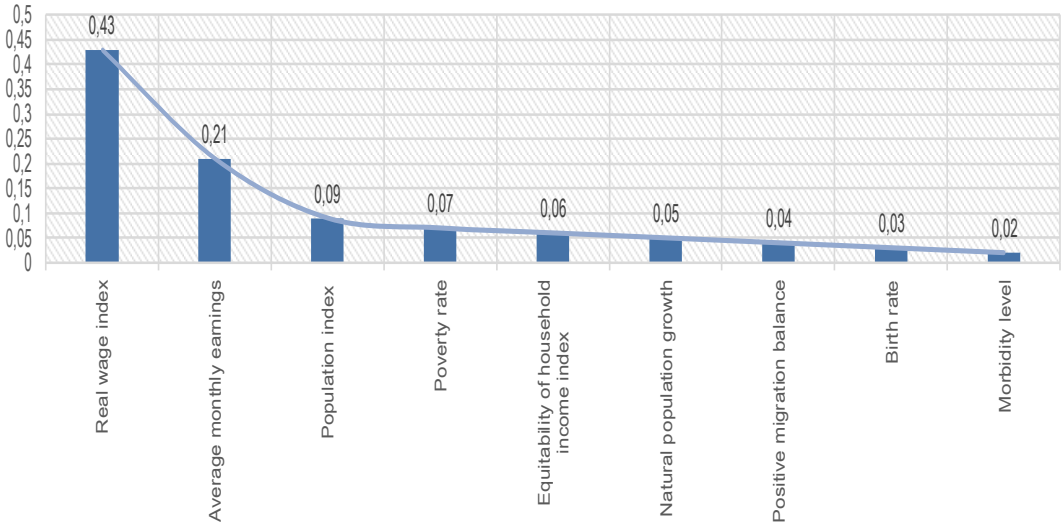

Figure 3 - Dispersion value of expert estimates of significance of monotowns' social development indicators

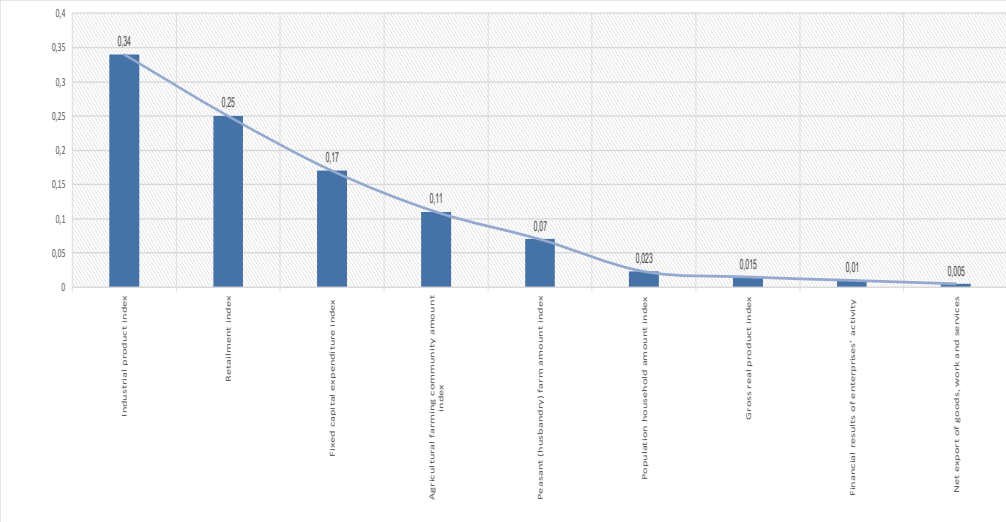

Figure 4 - Dispersion value of expert estimates of significance of monotowns' economic development indicators

Distinguishing statistically significant indicators ends with the index at which the decrease in % dispersion is maximally slowing, *i.e.* the curve of coefficient values dispersion tends to a horizontal line. The adequacy of the results of the survey is proved statistically based on Kendall's concordance coefficient, the value of which is 0.68:

$$W = \frac{12S}{m^2(n^3-n)}, \quad (2)$$

$$S = \sum_{i=1}^{n}\left(\sum_{j=1}^{m} R_{ij}\right)^2 - \frac{\left(\sum_{i=1}^{n}\sum_{j=1}^{m} R_{ij}\right)^2}{n}, \quad (3)$$

where: m– a number of respondents (a number of surveyed employees for each company); n– a number of factors (a number of criteria for assessing staff loyalty (questions in the questionnaire)); S – the sum of squares of rank differences (deviations from the average); R_{ij} – ranking score.

Based on the results of expert evaluation, the sample of statistical indicators of economic development of Kazakhstan monotowns for 2015 includes:

- industrial production index, %;
- retail trade index, %;
- index of a number of agricultural enterprises, %;
- index of a number of peasant (husbandry) farms, %;
- index of a number of population household, %;
- index of investment in fixed assets, %.

The sample of statistical indicators of monotowns' social development includes:

- population size index, %;
- index of real wages, %;
- index of average monthly salary %.

The source of statistical information is the Ministry of National Economy of the Republic of Kazakhstan, the Statistics Committee (Ministry of National Economy of the Republic of Kazakhstan in 2015). For the purpose of ranking of Kazakhstan monotowns, integrated indicators of economic and social development of each territorial entity were calculated in a matrix of development strategies.

Integrated index was calculated with considering the impact of each group of indices of monotowns' social and economic development on the resulting integrated index of development:

$$I = \sum_{i=1}^{n} W_i \times X_i, \quad (4)$$

where: I is the integrated index of social/economic development of a monotown; W_i – a coefficient of significance of the factor of social/economic development of monotowns; X_i – factor score of social/economic development of monotowns; n – a number of factors of social/economic development of monotowns.

Factors of social/economic development of RK monotowns were determined by principal component analysis using the application software Statistica 10. Impact of the factor reflects the percentage of dispersion. The results of the factor analysis of social/economic development of monotowns are shown in Tables 1 and Table 2.

Table 1 - Eigen values of economic growth factors of RK monotowns

Factors	Eigen value	Dispersion,%	Cumulative eigen value	Cumulative dispersion,%
1	2.19146	36.5243	2.19146	36.5243
2	1.21816	20.3027	3.40962	56.8271
3	1.18677	19.7796	4.5964	76.6066

The result of principal component analysis is the formation of 3 factors of economic development of Kazakhstan monotowns, the level of influence of which on the integral indicator of economic development is 76.6%

Table 2 - Eigen values of social growth factors of RK monotowns

Factors	Eigen value	Dispersion,%	Cumulative eigen value	Cumulative dispersion,%
1	2.116686	74.55622	2.116686	74.55622

One factor of social development of the RK monotowns was formed, affecting the integrated index of social development by 74.56%. The results of calculation of social/economic development of Kazakhstan monotown integrated index as of 2015 are presented in Tables 3 and Table 4.

Table 3 - Integrated index value of the level of economic development of RK monotowns

Monotown	Integrated index value of the level of economic development
Stepnogorsk	-0.02425
Khromtau	0.058755
Tekeli	0.154596
Kulsary	0.589418
Aksay	0.034979
Karatau	-0.11122
Zhanatas	1.703547
Balkhash	0.207874
Zhezkazgan	-0.18012
Karazhal	0.093398
Saran	-0.12272
Satpayev	0.203784
Temirtau	-0.35582
Shakhtinsk	-0.2255
Abay	0.351302
Arkalyk	-0.02714
Zhitikara	0.11315
Lisakovsk	-0.75646
Rudny	0.079801
Zhanaozen	-0.44185
Aksu	-0.47141

Monotown	Integrated index value of the level of economic development
Ekibastuz	-0.19447
Zyryanovsk	-0.27222
Kurchatov	-0.3073
Ridder	-0.08434
Kentau	0.19209

Table 4 - Integrated index value of the level of social development of RK monotowns

Monotown	Integrated index value of the level of social development
Stepnogorsk	-0.41189
Khromtau	-0.54291
Tekeli	0.54634
Kulsary	1.73856
Aksay	0.35456
Karatau	0.004621
Zhanatas	-0.01744
Balkhash	-0.27577
Zhezkazgan	-0.68003
Karazhal	-0.49823
Saran	-0.08333
Satpayev	-1.13178
Temirtau	-0.0546
Shakhtinsk	-0.53029
Abay	-0.37164
Arkalyk	-0.50132
Zhitikara	0.061748
Lisakovsk	-0.40244
Rudny	-0.04979
Zhanaozen	2.416652
Aksu	-0.7856
Ekibastuz	0.274321
Zyryanovsk	0.3419
Kurchatov	0.577768
Ridder	-0.19585
Kentau	0.216471

The basis for calculating the values of the factors is the valuation indicators, which is carried out by dividing the absolute deviations of the actual values from the average by the standard deviation. Therefore, the average level of Kazakhstan monotown social/economic development factors and consequently the integrated index, acquires a value of "0". If the factor value is more than "0", we can assume that the level of monotown's social/economic development is high, if less than "0", it is low. On the basis of this gradation of values, Kazakhstan monotowns were ranked at the level of the integrated index; and the matrix of monotowns' development directions was formed as of 2015 (Figure 5).

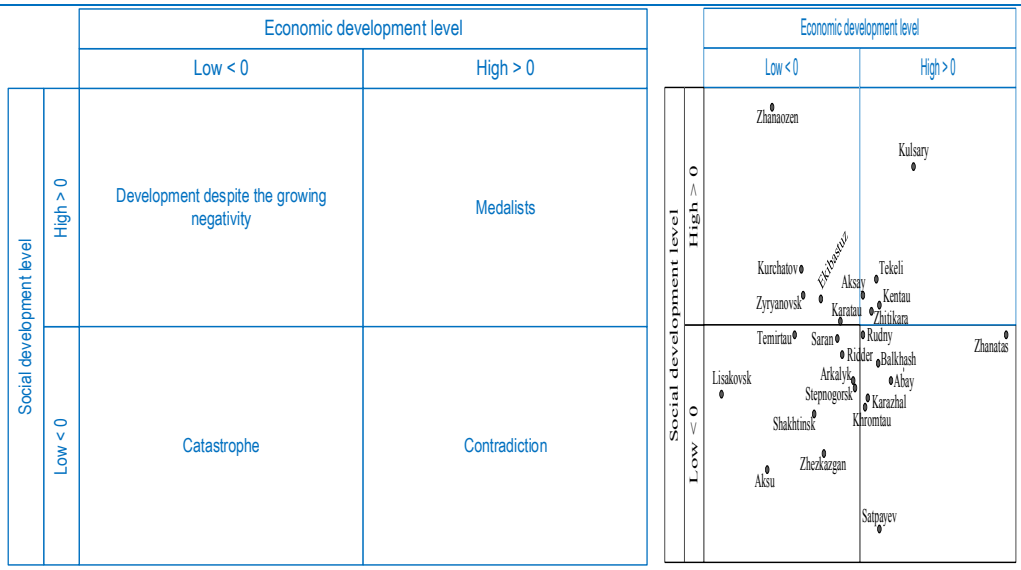

Figure 5 – Matrix of social and economic development strategies for RK monotowns as of 2015

On the basis of the matrix formalization, it was revealed that such monotowns as Zhanaozen, Kurchatov, Zyryanovsk, Ekibastuz and Karatau in modern conditions are characterized by a strategy of socio-economic development "Development despite the growing negativity", *i.e.* in case when the level of economic development is low, social development in the region is at a high level. The high level of economic and social development according to the "Medalists" strategy is reflected by monotowns: Kulsary, Tekeli, Kentau, Zhitikara and Aksai.

The "Catastrophe" strategy characterizes the current socio-economic development of the dominant amount of RK monotowns: Temirtau, Saran, Ridder, Arkalyk, Stepnogorsk, Shakhtinsk, Lisakovsk, Zhezkazgan and Aksu. These territorial entities are on the level of socio-economic degradation, provided by a low level of economic development which contributed to the low level of social development of the cities.

Such cities as Rudny, Abay, Zhanatas, Karazhal, Khromtau, Balkhash and Satpayev in modern conditions are developing on the basis of the "Contradiction" strategy that provides a high level of economic development of the cities and the low level of their social development.

Discussion

On the basis of differentiation of RK monotowns according to their strategic areas of development, it is possible to describe in more detail the strategic development of monotowns at the present stage and to formulate orienting directions of their development in order to increase the level of potential socio-economic development and ensuring its sustainability.

Mono towns of the strategic direction development group "Development despite the growing negativity" are characterized by a high level of social development against the background of the initial stage of reduction of economic development. This situation is temporary and in conditions of constantly progressive deterioration of the economy of the city, the reduction of social development will be ensured. The "strategy of concentration" should be used in these circumstances.

Diversification of production of a monotown with the aim to ensure the expanded reproduction of qualitative improvement of organization of production, formation of innovative and technological mechanisms by integrating various science-based productions, technologies, reducing the tax burden on small businesses, carrying out cost reduction policy for business, setting priority of industries of strategic importance, promoting development of industrial clusters, reduction of administrative barriers preventing the development of industry, development of inter-regional cooperation of industrial enterprises, etc. should be the optimization strategy of socio-economic development.

Monotowns that are currently developed according to the "Medalists" model are the leaders of socio-economic development in the country. The high level of competition in the various fields, the presence of monopolization of market and availability of a highly developed infrastructure, a high level of human capital is observed. For this type of monotown it is necessary to improve the efficiency of economic and social development

"sustainable development strategy". Much attention should be paid to the solution of social problems, first of all, social protection of poor and vulnerable segments of population, as a prerequisite for the sustainable improvement of living standards; orientation of the social structure of society in favor of the middle class; formation of socially oriented economy in the city, preserving the openness of the economy, rational use of established economic potential, stimulating the development of emerging companies. It is of particular relevance to innovatively develop regions as a factor for sustainable development of the city. Therefore, legal support of innovative entrepreneurship is appropriate, with a view to disposing the threat of its displacement from the market; activation of the financing process by providing various tax incentives.

Kazakhstan monotowns developing according to the "Contradiction" model have a low level of social development that provokes and threatens instability to urban economics development. In the short term, the low quality of human capital is a threat to the economic security of the city. "Building strategy" should be an optimization strategy of socio-economic development for this monotown group; the social orientation of the economy; the formation and accumulation of human capital should be the basis for domestic development of city; achievement of full and productive employment; providing targeted social protection of the disabled and the poor; improving the quality of social infrastructure objects; the formation of an integrated rehabilitation system and social adaptation of population of the city.

High-quality reproduction of human potential is inextricably linked with the expansion of the range of services provided by education and health care institutions. In this regard, increase in availability and quality of these services in monotowns is of significant importance, on which the continuous ongoing development of human potential largely depends. The formation of human capital through education and vocational training will contribute to the revitalization of the investment process in the city; it will activate the development and introduction of new technologies and increase the production impact per employee.

Monotown group, developing in modern conditions on the basis of the "Catastrophe" strategy is in a disadvantaged socio-economic position. It is characterized by the increasing decline in production, high unemployment, poor quality of social and economic infrastructure, lack of own funds.

Under existing conditions, the "Intense Recovery Strategy" should be an optimization model of a monotown development, which provides an advanced growth of industries, ensuring development of human potential; increasing the quality of human capital and the efficiency of its use, which is characterized by anticipating growth of skilled workers' wages; the transition from export-and-raw material to an innovative type of economic growth that will serve as the basis for the formation and a new social development mechanism; overcoming the existing negative demographic trends, population stabilization and the creation of conditions for its growth, improving living standards and the quality of life in general; creation of conditions for sustainable growth in wages balanced with an increase in productivity and quality of labor, creation of effective mechanisms for regulating the labor market, providing a combination of competition on labor market with partnerships of workers, employers and the state; strengthening the relation of work pensions with wages, increase of pensions, taking into account the development of the voluntary funded pension savings, up to a level that ensures a decent standard of living for pensioners; providing access to high-quality services of education, healthcare and culture through deep structural and technological modernization of these areas; providing high professional and territorial mobility of the labor force, formation of professional culture, labor and entrepreneurial values.

This strategy includes also creation and development of competitive markets, consistent de-monopolization of economy of cities; supporting the creation of new companies and new businesses based on innovations (start-ups), stimulating the development of small businesses; reduction of investment and business risks through the development of financial institutions, macroeconomic stability ensuring, protection of property rights and improving predictability of economic policy in monotowns; creating conditions for activation of business initiative.

The formed optimization strategic models of RK monotowns' social and economic development with accounting current trends of their development will allow ensuring incorporate interaction of social and economic development of monotowns. It will contribute to the diversification of the state policy regarding the Republic monotowns, and, therefore, the efficiency of using public funds with a view to resolve the problem of the majority of Kazakhstan's non-diversified settlements.

Conclusion

Thus, the developed conceptual approach to determining strategic directions of monotown development as exemplified by RK represents a new approach in the management system of non-diversified territorial entities development. A distinctive advantage of this approach from the generally accepted approaches used in practice and presented in theory is the differentiated approach to working out strategic directions of monotown

development. Based on accounting the current level and the effect of the interdependence of social and economic development, monotowns are grouped by type of strategic development based on the matrix “index of economic development of a monotown”–“index of social development of a monotown”. This approach allowed arguingthe peculiarity of state of their socio-economic development and identifying current strategies of development: “Development despite the Growing Negativity” (high level of social development/low level of economic development); “Medalists" (high level of social development/high level of economic development); “Contradiction” (low level of social development/high level of economic development); “Catastrophe” (low level of social development/low level of economic development). The ability to determine the current strategies for socio-economic development of monotowns allowed developing advanced strategies of RK monotowns’ socio-economic development on a case-by-case basis in order to increase their effective functioning.

The conceptual approach to the formation of monotown development strategies, designed in the study, serves as a basis for improvement of theoretical and methodological bases of management of regions development. It promotes reasonable determination of the priorities of the state policy in the field of funding of multi-territorial entities with regard to their socio-economic importance.

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Method for Adjusting Current Appropriations under Irregular Funding Conditions

Aleksandr Mikhaylovich BATKOVSKIY
Joint Stock Company Central Research Institute of Economy
Management and Information Systems, "Electronics", Moscow, Russia
batkovskiy_a@instel.ru

Alena Vladimirovna FOMINA
Joint Stock Company Central Research Institute of Economy
Management and Information Systems "Electronics", Moscow, Russia
fomina_a@instel.ru

Elena Georgievna SEMENOVA
Institute of Innovative and Basic Postgraduate Education
St. Petersburg State University of Aerospace Instrumentation, St. Petersburg, Russia
egsemenova@mail.ru

Valeriy Yaroslavovich TROFIMETS
Saint-Petersburg University of State Fire Service of Emercom of Russia, Russia
zemifort@inbox.ru

Elena Nikolaevna TROFIMETS
Saint-Petersburg University of State Fire Service of Emercom of Russia, Russia
ezemifort@inbox.ru

Abstract:

The study suggests using the indicators that characterize the process of funding to equation the problem of adjusting current appropriations under irregular funding pattern. The principal assumption of the methodology is that the proportionality of the residual unpaid part of the limit for each project to be funded should be observed. This requirement is stipulated by practical considerations and explained by the necessity to implement a whole number of projects whose component parts are included into a large scale project (program). The methodology solves the problem of adjusting funds distribution between the projects to be funded based on the profiles that have been formed at the earlier stages of funding. However, for the first stage of funding, the retrospective distribution profiles are not available; therefore, the additional task has been set to solve the optimization problem of redistributing current fund allocations without taking into account the retrospective distribution profiles. The compromise principle is represented by the fair concession principle that solves the problem of multi-objectiveness in a radical way by applying the convolution of the set of criteria to obtain one integrated criterion. Practical applications of the developed indicators and methods have been illustrated by a number of examples.

Keywords: funding, resource allocation problem, financial modeling, mathematical programming, multi-objectiveness.

JEL Classification: L10, O22, O29.

1. Introduction

Dynamic influence of the internal and external factors, many of which have a random and often indefinite nature, cause the need in correction of allocating funds between financing objects with account of the currently shaping situation. If the project manager has an amount of money enough for financing each object in the project (subproject) at his/her disposal, then the task of current allocation is irrelevant and solved automatically. The deficit situation is considerably more difficult when the total volume of the demand for financing exceeds the amount of money available to the manager. In this case, the problem of adjusting the current assignments becomes nontrivial. There are no universal recommendations here. The method for adjustment of the current assignments based on the optimization model of smoothing out the discrepancy of cash proceeds at the previous funding stages will be discussed below.

2. Literature review

The considered problem of adjusting the current assignments pertains to the wide class of the optimization problems of resource allocation. The problems of this class emerge in various fields of science, technology and social sphere. The nature of the allocated resources and meaning of the optimality can be different depending on the considered application area and specific problem.

Setting of the problems of resource distribution in different subject domains is considered in numerous literature sources (Wagner 1975, Antoniou and Lu 2007, Taha 2010, Chong and Zak 2013, Lange 2013, Hillier and Lieberman 2014, Zolotarjov 2014, Fujisawa *et al.* 2015), and other.

Setting of problems of resource allocation in the sphere of economics and finances can be found in the works of (Craven and Islam 2005, Cornuejols and Tutuncu 2006, Urubkov 2006, Eiselt and Sandblom 2013, Ouardighi and Kogan 2013) and others.

Obviously, the most effective results of solving the optimization problems of this class should be expected during analysis of certain mathematical models of the systems under study, the research of which often leads to setting single criterion and dynamic problems of mathematical programming. Theory, analytical approaches and numerical methods for analysis of the specified class of tasks are generally considered quite fully developed (Wagner 1975, Taha 2010, Zelinka *et al.* 2012, Bahmani 2014, Byrne 2014, Durea and Strugariu 2014, Arora 2015). Nevertheless, the application of the mathematical programming methods to the subject industry problems still arouses interest of researches and leads to effective results.

Meaningful applied real-world problems mostly happening in subject areas lead to the need in researching mathematical models of complex systems by many criteria. The variety of multi-criterion problems begot a great deal of methods for multi-criterion analysis of solutions – Multi Criteria Decision Analysis (MCDA) (Arora 2015, Nogin 2002, Larichev and Olson 2001, Podinovskiy 2007, Bui and Alam 2008, Tang 2012, Grad 2015) and others. Various examples of using the multi-criteria analysis methods for solution of financial and economic problems can be found in (Eiselt and Sandblom 2013, Zopounidis and Pardalos 2010, Xidonas *et al.* 2012, Saaty and Vargas 2013, Doumpos and Zopounidis 2014).

3. Methodology

Classification of resource allocation problems

Resource allocation problems occur when there is a certain set of works or operations to be performed, and the available resources for performance of each of them to the best are not enough. The methods for allocation of limited resources during performance of various operations in the control system can vary. In order to solve the problem of resource allocation, it is necessary to define a certain system of preferences or a decision rule. Such a decision-making rule for determination of volume of resources, which are reasonable to allocate to each process is usually developed with account of optimization of a certain target function with limitations on the volume of available resources and time characteristics.

Depending on the conditions of the problem, resource allocations divide into three classes:

1. *Works (objects) and resources are set*. Resources should be allocated between the works (objects) so that they maximize a certain measure of effectiveness or minimize the expected costs. For example, the enterprise is given a production task for a specified period. Capacities of the enterprise are known. You need to select production methods for each unit of the product to perform the task with minimal costs.
2. *Only resources are set*. You need to determine what scope of works needs to be carried out with account of the resources to ensure the maximum of a certain measure of efficiency. For example, there is an enterprise with certain production capacities. You need to plan the range and volume of the product output, which would allow maximizing the income of the enterprise.
3. *Only works are set*. You need to determine what resources are required to minimize total costs. For example, product output plan is made. You need to determine the required amount of raw materials and production capacities to meet the production plan with minimal costs.

The considered problem of adjustment of current assignments pertains to the first class of resource allocation problems. For specification of setting this problem and its subsequent formalization, let us consider the indicators characterizing quality of the process of appropriating financial resources by the funds holder.

Total indicators of financing quality

The indicator of *fullness* (*security*) of financing and the indicator of *timeliness* (*regularity*) of financing can be related, in our opinion, to the general indicators characterizing quality of the financing process. These indicators characterize potential possibility of solving the problem (project, subproject) with the set quality and in the set period. Consider the entered indicators in some more detail:

- The indicator of fullness (security) of financing can be determined by the equation:

$$k_C = \frac{V^F}{V^P} \tag{1}$$

where V^P – planned volume of funds to be allocated for the financing object; V^F – actual volume of funds allocated for the financing object.

- Indicator of timeliness (regularity) of financing can be determined by the equation:

$$k_T = \begin{cases} 1, & t^F \le t^P, \\ 1 - \dfrac{t^F - t^P}{T}, & t^P < t^F < t^P + T, \\ 0, & t^F \ge t^P + T, \end{cases} \tag{2}$$

where: t^P – planned financing term, t^F – actual financing term, T – time interval between two consequent planned financing terms.

Graphic explanation of the equation (2) is provided in Figure1.

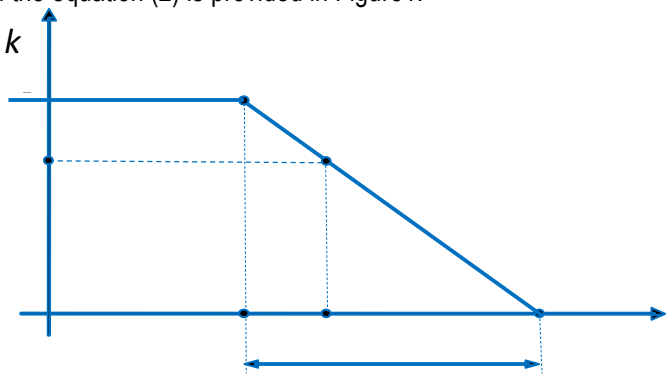

Figure 1 – Graphical explanation of k_T

Figure 1 shows how the value of financing timeliness (regularity) indicator k_T varies depending on the t^P and t^F values ratio. Unless the actual fund receipt term exceeds the plan, then k_T takes on the highest possible value equal to 1. In case the actual funds receipt term exceeds the plan, but still lies within the interval between two consecutive financing terms, then $k_T \in [0, 1]$ and changes along the linear decay function. In case the actual funds receipt term matches or exceeds the planned financing term, then k_T takes on the lowest possible value equal to 0.

The proposed equations for calculation of coefficients of financing fullness and timeliness have a place for the elementary scheme when financing is carried out by a one-time payment. In practice, more complex cash flow schemes are used when financing is distributed in time.

A year is typically used as a planned financing period. Typical funds receipt terms are: a month, a quarter, a half-year period. In this case, there is a need to calculate integral coefficients of financing fullness and timeliness for the planned period on the basis of particular values in the interval periods:

$$\bar{k}_C = \frac{\sum_{i=1}^{m} k_{C_i}}{m}, \tag{3}$$

$$\bar{k}_T = \frac{\sum_{i=1}^{m} k_{T_i}}{m}, \tag{4}$$

where: m – number of financing periods (typical values m: m = 2 – times per a half-year period, m = 4 – quarterly, m = 12 – monthly).

For example, there is a data of the planned and actual values of parameters of the "alpha" project financing (Table 1).

Table 1 – Planned and actual values of the “alpha” project financing

Planned date of financing	Actual date of financing	Planned volume of financing	Actual volume of financing
January 10	February 17	120.000	100.000
April 1	April 10	250.000	200.000
July 1	July 1	150.000	170.000
October 1	October 3	150.000	150.000

Values of financing coefficients calculated by equations (1) - (4) are provided in Table 2.

Table 2 – Values of "alpha" project financing coefficients

Period	Financing fullness coefficient	Financing timeliness coefficient
Quarter 1	0.83	0.53
Quarter 2	0.80	0.90
Quarter 3	1.13	1.00
Quarter 4	1.00	0.98
Integral value for all periods	0.94	0.85

As an integral indicator characterizing the process of financing, we propose using *the financing stability (reliability) coefficient:*

$$k_R = k_P \times k_T \tag{5}$$

Correctness of the equation (5) is confirmed by practical considerations. Hence the “later” receipts of funds depreciate their value because they cannot be disbursed to the full extent. The financing coefficient in this case can be considered as a kind of the adjustment coefficient of the financing fullness coefficient. Note, however, that $k_T \in [0, 1]$ (*See* equation (2)), which allows avoiding the inconsistency of the situation in case of incomplete financing before the planned term. For example, if $k_P = 0.6$ and $k_T = 1.5$, then $k_R = 0.9$. We will get the same result if the financing is on time ($k_T = 1$) and 90% of the planned volume ($k_P = 0.9$). However, the second option is obviously more preferable. The equation (2) allows overcoming the existing controversy. When it is used for the first option, we have $k_P = 0.6$.

Values of the financing stability coefficient for the above-mention “alpha” project are provided in Table 3.

Table 3 - Values of the “alpha” project stability coefficient

Period	Financing stability coefficient
Quarter 1	0.44
Quarter 2	0.72
Quarter 3	1.13
Quarter 4	0.98
Integral value for all periods	0.82

Thus, the financing stability coefficient can be considered as the expected problem completion degree (project, subproject) at the set time interval.

Current appropriations adjustment method

The situation of actually allocated funds deviating from the schedule of approved assignment limits is quite frequently observed in the practice of financing a large-scale complex project. As a result, in separate planned periods (for example, quarters), the so called "surplus" (normally at the end of the year) or "deficits" (normally at the beginning of the year) of money resources, which leads to disruption of the project schedule.

The proposed method is intended for adjustment of current assignment allocation between financing objects to smooth out the mismatch that occurred at the previous financing stages. The key provision underlying the developed method is the requirement of proportion of the outstanding part of the limit on each financing object. This requirement is determined by practical considerations and normally connected with the need in parallel execution of the whole range of the projects included as the constituting elements in a large-scale project (program). The list of initial data required for the method for adjustment of current assignment allocation to financing objects consists of the following indicators:

- L_i– approved limits of assignments for each *i* ($i = \overline{1,n}$) financing object for the planned period (year).
- PCF_i^t – planned volume of assignments allocated to the *i* financing object in a period of time *t* (normally, $t = \overline{1,4}$, *i.e.* financing is done quarterly), $\sum_{t=1}^{4} PCF_i^t = L_i$.
- FCF_i^t – actual volume of assignments allocated to the *i* financing object in a period of time *t*;
- *S* – current volume of assignments distributed between the financing objects.
- The result of using the method is the sought vector of allocation of newly received assignments $(s_1, s_2, ..., s_n)$, and the obvious condition is fulfilled $\sum_{i=1}^{n} s_i = S$, *i.e.* the received assignments are distributed in full.

The point of the method is in execution of the following stages:

- Volume of actually payments made since the beginning of the planned period is determined for each financing object:

$$SCF_i = \sum_{t=1}^{t^*-1} FCF_i^t, \quad i = \overline{1,n}, \tag{6}$$

where t^* – period of time, for which newly received assignments are allocated.

- Level of costs incurrent at the moment relative to the limit for the planned period is determined for each financing object:

$$h_i = \frac{SCF_i}{L_i} \tag{7}$$

- Level of total costs incurred at the moment for all financing objects relative to their total limit for the planned period:

$$h^S = \frac{\sum_{i=1}^{n} SCF_i}{\sum_{i=1}^{n} L_i} \tag{8}$$

- Relative over payment (underpayment) relative to the level of total costs incurred at the moment for each financing object:

$$d_i = \frac{h_i - h^S}{h^S} \tag{9}$$

- Volume of currently outstanding part of the approved limits is determined for each financing object:

$$SCF_i^* = L_i - SCF_i \tag{10}$$

- Total volume of currently outstanding part of the approved limits is determined:

$$SCF^* = \sum_{i=1}^{n} SCF_i^* \tag{11}$$

- Optimization problem of the following kind is solved:

$$\sum_{i=1}^{n} (d_i + d_i^*)^2 \to \min$$

$$\begin{cases} \sum_{i=1}^{n} s_i = S, \\ SCF_i + s_i \le L_i, \\ s_i \ge 0, \end{cases} \tag{12}$$

$$d_i^* = \frac{\frac{s_i}{SCF_i^*} - \frac{S}{SCF^*}}{\frac{S}{SCF^*}}$$

where: – relative overpayment (under payment) for each financing object relative to the level of payment of the outstanding part of the limits in the forthcoming assignment allocation.

Problem (12) has a corresponding calculation complexity, so it is reasonable to use appropriate software to solve it. As a piece of software of this kind, we can recommend an Excel spreadsheets software add-on "Search of solution". Since the problem (12) is non-linear, then gradient search methods should be used to solve it. The important thing about using this method is correct setting of search direction and step length on each iteration, which determines the accuracy of obtained results and speed of convergence, *i.e.* number of iterations to reach the extreme value.

The methods for choosing a direction and step length have different types. In particular, the conjugate gradient method and the Newton method are implemented in the "Search of solution" software add-on. The conjugate gradient method (the first order search method) is a method using the values of the first derivatives of the target function to determine the direction β and step *t*. The Newton method (the second order search method) is a method using the values of the second derivatives of the target function to determine the direction β and step *t*. The higher the order of the methods, the more calculations are on each iteration, but less iterations are required, and vice versa. The most appropriate method for most of practical problems is the conjugate gradient method. Such situation is explained by the fact that, on the one hand, it does not require considerable calculations on each iteration because only the target function and its first derivatives are calculated and on the other hand, this method has quite appropriate convergence, which means it provides the extreme value finding in a small number of iterations. This is why we propose using the conjugate gradient method to solve the problem (12). The algorithm of the method for adjustment of current assignment allocation to financing objects is provided in Figure 2.

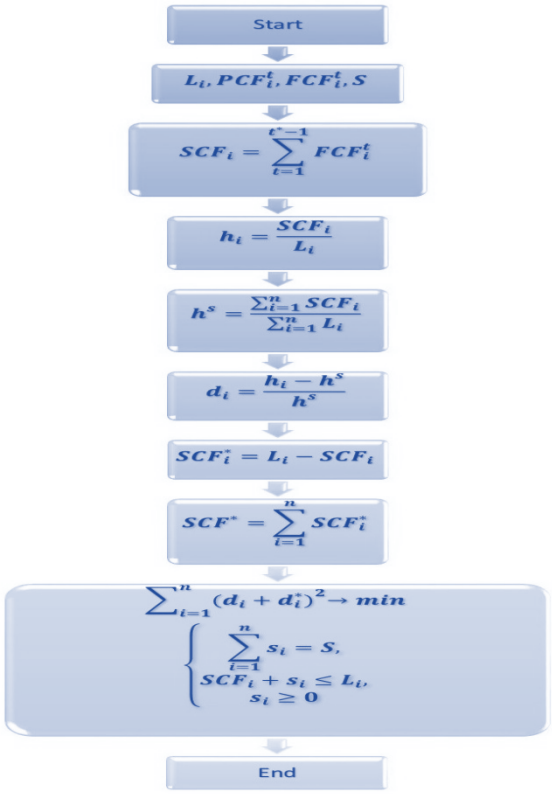

Figure 2 – Allocation adjustment algorithm for current appropriations by the projects to be financed

4. Results

Problem setting

There are five financing objects, for which assignment limits are approved per year and per quarter (Table4).

Table 4 – Approved assignment limits

Projects to be funded	Quarterly assignment limits, conventional units				Annual assignment limits, conventional units
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	
Alpha	200	300	320	280	1.100
Beta	300	350	320	300	1.270
Gamma	150	200	200	200	750
Delta	450	450	430	450	1.780
Kappa	350	370	330	310	1.360

The objects have been financed for two quarters. Actual volumes of assignments for the specified periods are provided in Table 5.

Table 5 – Actual volumes of assignments for the 1st and 2nd quarters

Projects to be funded	Funding by quarters, conventional units			
	1st quarter		2nd quarter	
	Plan	Fact	Plan	Fact
Alpha	200	150	300	250
Beta	300	220	350	300
Gamma	150	130	200	200
Delta	450	400	450	430
Kappa	350	300	370	330

The funds in the amount of 1950 conditional currency units have been allocated for the third quarter. The task is to formulate the vector for distributing the newly received allocations (s_1, s_2, s_3, s_4, s_5) between the projects to be funded.

Solving the problem

The developed methodology will be applied to solving this problem. For each object of funding the amount of actual payments from the beginning of the planning period (SCF_i) will be calculated according to equation (6), and the level of the costs incurred to date relative to its limit for the planning period (h_i) will be calculated according to equation (7). The results of the calculations are shown in Table 6.

Table 6 – Calculated values SCF_i and h_i

Projects to be funded	SCF_i	h_i
Alpha	400	0.364
Beta	520	0.409
Gamma	330	0.440
Delta	830	0.466
Kappa	630	0.463

According to equation (8), calculate the level of the total costs incurred to date for all objects of funding relative to the sum of their limits for the planning period:

$$h^S = \frac{\sum_{i=1}^{n} SCF_i}{\sum_{i=1}^{n} L_i} = \frac{2710}{6260} = 0{,}433$$

.

According to eq. (9), calculate the relative overpays (underpays) as compared to the level of the total costs actually incurred to date (d_i) for each object of funding; and, according to eq. (10), calculate the part of the approved limits that has not been paid to date (SCF_i^*). The results of the calculations are shown in Table 7.

Table 7 – Calculated values d_i and SCF_i^*

Projects to be funded	d_i	SCF_i^*
Alpha	-16.0%	700.00
Beta	-5.4%	750.00
Gamma	1.6%	420.00
Delta	7.7%	950.00
Kappa	7.0%	730.00

According to equation (11), calculate the total amount of the part of the approved limits that has not been paid to date:

$$SCF^* = \sum_{i=1}^{n} SCF_i^* = 3550$$

.

Upon performing the preliminary calculations, proceed with solving the optimization problem (12). The solution of the problem is shown in Table 8.

Table 8 – Calculated values d_i^* and s_i

Projects to be funded	d_i^*	s_i
Alpha	15.4%	443.87
Beta	4.8%	431.82
Gamma	-2.0%	226.15
Delta	-8.5%	477.61
Kappa	-7.6%	370.55

The value of the target function is as follows:

$$\sum_{i=1}^{n} (d_i + d_i^*)^2 = 0$$

,

Thus, the found principle for distributing the current fund allocations smooths the misalignment of the object funding that occurred at the previous stages. At the final stage (the fourth quarter), to fulfill the approved fund

allocation limits, the objects under consideration should have to be funded in the amount of 1600 conditional currency units: S = 6260 – 1200 – 1510 – 1950. Thereat, the fund allocations should be distributed between the objects of funding in the amounts shown in Table 9.

Table 9 – Distribution of funds in the 4th quarter

Projects to be funded	s_i
Alpha	256.13
Beta	318.18
Gamma	193.85
Delta	472.39
Kappa	359.45

5. Discussions

The suggested methodology solves the problem of adjusting the principle of distributing the current fund allocations based on the actual distribution profiles established at the earlier stages of funding. However, no retrospective profiles are available for the first stage; therefore, under the situation of insufficient funding at the first stage, there is a problem of distributing the current fund allocations without taking into account the retrospective distribution profiles. This problem can be solved based on applying heuristic rules, mathematical models or their combinations.

It is suggested that the problem should be formally set as follows: there is a complex program that includes k subprograms. Each of them is estimated with the significance factor w_i, $\sum_{i=1}^{k} w_i = 1$. It has been found that for the purpose of implementing i-subprogram, funding D_i is required; thereat, the minimum permissible level of funding is h%. It is assumed that the degree of the fulfillment of the subprogram with the allocated amount of d_i will make $q_i = \frac{d_i}{D_i}$, $0 \le d_i \le D_i$. The task is to find such pattern of distributing the total amount of funding S between k subprograms, under the conditions of deficiency ($\sum_{i=1}^{k} D_i > S$,), that the degree of fulfillment of the whole program Q should be maximal:

$$\begin{aligned} & Q \to \max, \\ & \sum_{i=1}^{k} D_i > S, \\ & i = 1...k, \\ & d_i \ge D_i \times \frac{h}{100}, \\ & S \ge \sum_{i=1}^{k} \left(D_i \times \frac{h}{100} \right). \end{aligned} \tag{13}$$

The most important stage of specifying the problem (13) is to select the type of its target function. The issue with such a selection is that the type of the target function predetermines not only the value, but also the properties of optimum solution, which sets serious requirements to choosing the optimality principle based on the corresponding compromise principle.

One of the most widespread compromise principles is represented by the fair concession principle that solves the problem of multi-objectiveness by a radical method applying the convolution of the set of criteria to obtain one integrated criterion that, from the perspective of the preference system of the decision maker (DM), is equivalent to this set of criteria. The fair concession principle has two types: the absolute concession principle and the relative concession principle. Selecting one of the compromise principles makes it possible to justify the selection of the type of the target function in a well-argued manner.

The absolute concession principle corresponds to the optimality principle that implies maximizing the sum

of the products of the local criteria and their weight factors:

$$Q = \sum_{i=1}^{k} w_i q_i \quad . \tag{14}$$

With this compromise principle, the high value of the integrated criterion is obtained due to the high values of some local criteria and due to comparatively small values of other criteria, i.e. there is strict differentiation between the levels of some certain local criteria.

The relative concession principle corresponds to the optimality principle that implies maximizing the product of the criteria powered by their weight factors:

$$Q = \prod_{i=1}^{k} q_i^{w_i} \quad . \tag{15}$$

The relative concession principle is quite sensitive to the values of the local criteria; thereat, due to the relativity of the concession, the "price" of the concession becomes lower automatically for the local criteria with large values and vice versa. Finally, the levels of the local criteria are smoothed considerably.

The considered integrated criteria (additive and multiplicative) result in the decisions that represent the limit special cases of the solution region preset by generalized aggregation operator:

$$Q = \sum_{i=1}^{k} w_i q_i^{1/p} \quad , \tag{16}$$

where p is the factor that presets the type of the aggregation operator. At $p = 1$ the operator is additive, at $p < 1$– it is quasi-disjunctive, at $p > 1$ – it is quasi-conjunctive. At $p \to \infty$ the decision determined by the generalized aggregation operator asymptotically approaches the decision that is predetermined by the multiplicative operator.

The meaning of the quasi-conjunctive operator is that, with the low values of one or several aggregated criteria, the value of the operator decreases disproportionately to *x*. Applying quasi-conjunctive operators (similar to multiplicative operator) is stipulated by the rule as follows: for the high value of the integrated criterion (aggregation operator) it is necessary that all aggregated criteria should have high values.

The following rule is a precondition for applying quasi-disjunctive operators (similar to the additive operator): for the high value of the integrated criterion (aggregation operator) it is sufficient that at least one (or several) aggregated criterion should have high value. It should be noted that quasi-disjunctive operators are much less sensitive to change of p ($0 < p < 1$), as compared to quasi-conjunctive operators ($p > 1$); therefore, the former can be put beyond consideration for the purposes of solving practical problems.

Thus, the choice of that or another type of the target function should be based on the adopted compromise principle that, in turn, is predetermined by the preference system of the decision maker.

Apart from setting the type of the target function, it is necessary to specify, in the aggregation operator, the weight factors of the local criteria that could be identified applying different methods of expert evaluations described elsewhere in scientific literature. This study considers the pair-wise comparison method. The advantage of this method is that it enables the experts to set not the vectors of weights, but the vectors of priorities, i.e. to perform evaluation at qualitative level.

Example: Complex program includes 5 subprograms conditionally named: "alpha", "beta", "gamma", "delta", "kappa". For each of the subprograms for the first quarter the limits of fund allocations have been approved in the amounts as follows 200, 300, 150, 450 and 350 conditional currency units. Total amount of the allocated funds makes 1200 conditional currency units. Minimum permissible level of funding for each of the subprograms has been established as 40% of the approved limit. To evaluate the priorities of the subprograms, a group consisting of three experts has been arranged. The task is to find such pattern of distributing the total amount of funding between all subprograms that would ensure maximal fulfillment of the whole program. The activities of the experts can be arranged and their resulting judgments can be processed applying different approaches and methods that have been presented in much detail in different literary sources (Nogin 2012, Larichev and Olson 2001, Podinovskiy 2007, Saaty and Vargas 2013), etc. Consider one of the simplest approaches when the experts provide their judgments on two compared objects based on a three-point scale of correlations: 0 – *i*-object possesses lower significance than *j*-object; 1– significance values of *i*- and *j*-objects are equal; 2 – *i*-object possesses higher significance value than *j*-object. The alignment of the expert judgments is not checked. Assume that the experts provided the judgments shown in Tables 10-12.

Table 10 – Matrix of judgments of Expert 1

Subprograms	Subprograms					Σ
	Alpha	Beta	Gamma	Delta	Kappa	
Alpha		0	1	1	1	3
Beta	2		0	0	2	4
Gamma	1	2		0	2	5
Delta	1	2	2		2	7
Kappa	1	0	0	0		1
Total ∑						20

Table 11– Matrix of judgments of Expert 2

Subprograms	Subprograms					Σ
	Alpha	Beta	Gamma	Delta	Kappa	
Alpha		1	1	1	0	3
Beta	1		2	0	0	3
Gamma	1	0		0	2	3
Delta	1	2	2		2	7
Kappa	2	2	0	0		4
Total ∑						20

Table 12 – Matrix of judgments of Expert 3

Subprograms	Subprograms					Σ
	Alpha	Beta	Gamma	Delta	Kappa	
Alpha		0	1	0	1	2
Beta	2		2	1	1	6
Gamma	1	0		0	2	3
Delta	2	1	2		2	7
Kappa	1	1	0	0		2
Total ∑						20

The factors of priority of the subprograms calculated according to each expert judgment and their integrated values are shown in Table 13.

Table 13 – Summary results of the expertise

Experts	Subprograms					Σ
	Alpha	Beta	Gamma	Delta	Kappa	
Expert 1	0.15	0.20	0.25	0.35	0.05	1.00
Expert 2	0.15	0.15	0.15	0.35	0.20	1.00
Expert 3	0.10	0.30	0.15	0.35	0.10	1.00
Integral w_i	0.13	0.22	0.18	0.35	0.12	1.00

Upon performing the expertise and obtaining the values of the factors of priority w_i, it is possible to proceed with solving the problem of optimal distribution of the current fund allocations. Insofar, as the target function $Q = \sum_{i=1}^{k} w_i q_i^{1/p}$ is of nonlinear nature, the solution of the set problem would require applying the methods of nonlinear optimization. The problem (13) has been solved for four types of the aggregation operators: additive, multiplicative, quasi-disjunctive (for $p = 0.2$) and quasi-conjunctive (for $p = 2$). The solution to the problem with the target function represented as additive aggregation operator is shown in Table 14.

Table 14 – Solution to the problem of additive aggregation operator

Decision variables	Subprograms				
	Alpha	Beta	Gamma	Delta	Kappa
d_i	160.00	300.00	150.00	450.00	140.00
q_i	0.80	1.00	1.00	1.00	0.40

The solution to the problem with the target function represented as multiplicative aggregation operator is shown in Table 15.

Table 15 – Solution to the problem of multiplicative aggregation operator

Decision variables	Subprograms				
	Alpha	Beta	Gamma	Delta	Kappa
d_i	171.44	278.58	150.00	449.97	150.00
q_i	0.86	0.93	1.00	1.00	0.43

The solution to the problem with the target function represented as quasi-disjunctive (for p = 0.2) aggregation operator is shown in Table 16.

Table 16 – Solution to the problem of quasi-disjunctive (p = 0.2) aggregation operator

Decision variables	Subprograms				
	Alpha	Beta	Gamma	Delta	Kappa
d_i	200.00	300.00	150.00	410.00	140.00
q_i	1.00	1.00	1.00	0.91	0.40

The solution to the problem with the target function represented as quasi-conjunctive (for p = 2) aggregation operator is shown in Table 17.

Table 17 – Solution to the problem of a quasi-conjunctive (p = 0.2) aggregation operator

Decision variables	Subprograms				
	Alpha	Beta	Gamma	Delta	Kappa
d_i	166.64	293.36	150.00	450.00	140.00
q_i	0.83	0.98	1.00	1.00	0.40

Thus, as result of solving the problem (13) one of the variants can be obtained for distributing the current fund allocations at the first stage of funding.

Conclusion

Basic criteria of rationality in distributing the currently allocated monetary means are represented by the proportionality of the residual unpaid part of the limit of each object of funding upon each scheduled operation of distribution and by the regular pattern of allocating funds for each project to be funded. The requirement that the objects should be funded in a proportional manner is, as a rule, predetermined by the necessity to perform the activities in different areas in parallel and also by the complex nature of these activities. Applying the criterion of regularity to funding improves operational efficiency, and, consequently, the quality of the project implementation management.

The list of the criteria of the problem under consideration would not have been exhaustive if the current priorities of the objects of funding were not taken into account. They should be defined, for instance, for the cases when some important or urgent activities have to be performed.

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Rethinking of the Concept of Economic Systems Balance through Analysis of Disproportions of Economic Growth in the Global Economy

Tatiana ALFEROVA
Department of Management, Perm Institute of Economics and Finance[1], Russia
talferova@pief.ru

Olga ORESHINA
Volgograd State University[2], Russia
olgaoreshina@mail.ru

Inna V. UKRAINTSEVA
Department of International Trade and Customs Affairs
Rostov State University of Economics[3] (RINH), Russia
iukr1996@rambler.ru

Abstract

The purpose of the article is to verify the offered hypothesis and substantiate the necessity for rethinking of the concept of balance of economic systems through analysis of disproportions of economic growth in the global economy. This purpose is achieved with the methods of induction, deduction, synthesis, formalization, and systemic, structural, and problem analysis. The authors determine the sense of current concept of balance of economic systems, conduct analysis of disproportions of economic growth in modern global economy, substantiate necessity for rethinking of the concept of balance of economic systems, and offer new approach to treatment of the concept of balance of economic systems. As a result of the research, the authors come to the conclusion that concept of balance of economic systems in its modern understanding is not applicable to analysis of the global economic system. The authors develop a new formula of balance of the global economic system and provide practical examples of such balance for 100 recent years.

Keywords: concept of balance, economic system, disproportions of economic growth, global economy.

JEL Classification: P40, O40, F60.

1. Introduction

Actuality of the study of perspectives of determination of global economic balance is predetermined by strategic orientation of modern global economy at provision of sustainable and stable economic growth, which is impossible under the conditions of its imbalance within disequilibrium state. Economic growth and development stipulates maximization of satisfaction of public needs, which is a main task of economic science, which is solved in this paper.

Initially, the idea of balance emerged in macro-economic scale and was used for analysis of the state and perspectives of development of national economy. With development of the global economic system, this concept was distributed without changes in the global economy. Taking into account that principles of development of the global economy differ from principles, on the basis of which economy of particular countries develops, it is possible to suppose that analysis of the global economic system requires a new concept of balance, different from macro-economic one.

Use of incorrect concept of economic balance with analysis of the global economic system may be a cause for incorrect treatment of its state and perspectives of development, as well as selection and use of ineffective instrumentarium for regulation of international economic processes. This constitutes a scientific problem which should be solved in this paper.

Probably, the recent global financial crisis was indirectly caused by incorrect approach to establishment and preservation of the global economic balance. Its rethinking will allow not only quickening the process of overcoming the consequences of the global recession but transferring the global economic system to a new level of economic growth and development. Based on this, the authors offer a hypothesis that the concept of balance of economic systems in its modern understanding is not applicable to analysis of the global economic system, which leads to necessity for its rethinking in the context of analysis of disproportions of economic growth in the global economy. The purpose of the article is to verify this hypothesis and substantiate the necessity for rethinking of the

[1] Address: 141 Ekaterininskaya St., Perm, 614068, Russia
[2] 100 Universitetsky Ave., Volgograd, Russia
[3] 69 Bolshaya Sadovaya St., Rostov-on-Don, Russia

concept of balance of economic systems through analysis of disproportions of economic growth in the global economy.

2. Concept of balance of economic systems

According to the current concept of balance of economic systems, there are several types of balance (Aslam and Azhar 2013). Some scientists treat economic balance as normal functioning of economic system (Luperi 2015), *i.e.,* lack of economic crises (Nadtochey 2014). Economic system is in equilibrium state if it has capability for continuous functioning and reproduction or increase of rates of economic growth (Geseleva 2013). According to this point of view, balance appears in all cases of global economic growth (Jahfer and Inoue 2014).

Other scientists define balance of economic system as its well-balanced growth (Popkova *et. al* 2015), *i.e.,* situation, at which the following proportions are preserved (Donato *et. al* 2014):

- proportion of production factors – provision of business with necessary resources (labor, land, capital) (DiMatteo 2013);
- proportion of consumption and preservation – correspondence of the volume of consumed income and profit to needs of development of production and economy (Chateau and Saint-Martin 2013);
- proportion of distribution – even distribution of income from production activities between all owners of production factors (Michaelides *et. al* 2013);
- proportion of goods and money – correspondence of mass of commodities to mass of money in economy (José N'Guessan 2013).

Another point of view states that balance of economic system is correspondence of volume, structure, and prices of offer and demand (Gaspar *et. al* 2014). Balance by Pareto is very widespread notion (Savic *et. al* 2014) – it is a situation in economy during which the attempt of changing it for the purpose of improvement of the state of some persons the state of other becomes worse (Gudz 2014).

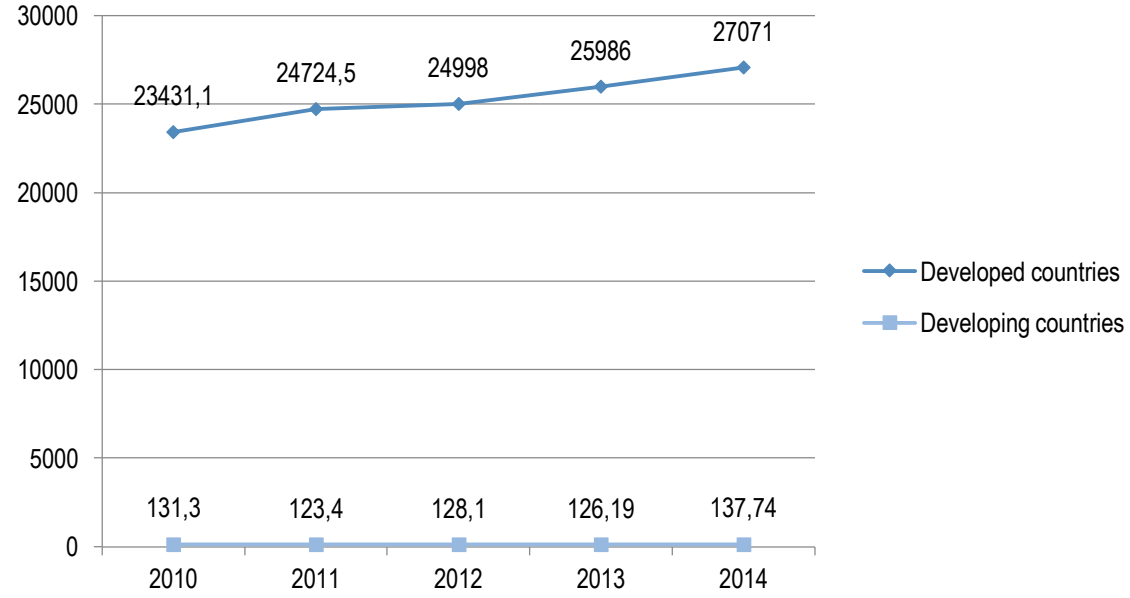
There's also a point of view that economic balance is full correspondence of production level to public needs – which supposes lack of excesses and deficit, lack of flaws, *etc*. (Hommes 2013). Balance in macro-economic scale could be established under the influence of the market mechanism within self-regulation of the system (Heikkinen 2014) or as a result of influence of the mechanism of state regulation of economic system (Vaughn 2013).

Despite the differences in approaches, they are united by definition of balance of economic system as its ideal state, to which it strives, but which is unreachable (Bugarin and Hazama 2014). It is worth noting that these approaches, which were initially developed by macro-economic examples and for macro-economy, remained unchanged and expanded into the global economic system (Md. Al and Sohag 2015, Eltejaei 2015).

If the above approaches to economic balance are viewed in the global scale, then we'll have a situation at which global economic system should strive for full balance of demand and offer, production and needs, position of all countries by Pareto, consumption and saving, commodities and money, even distribution of income and full provision of business with necessary production factors.

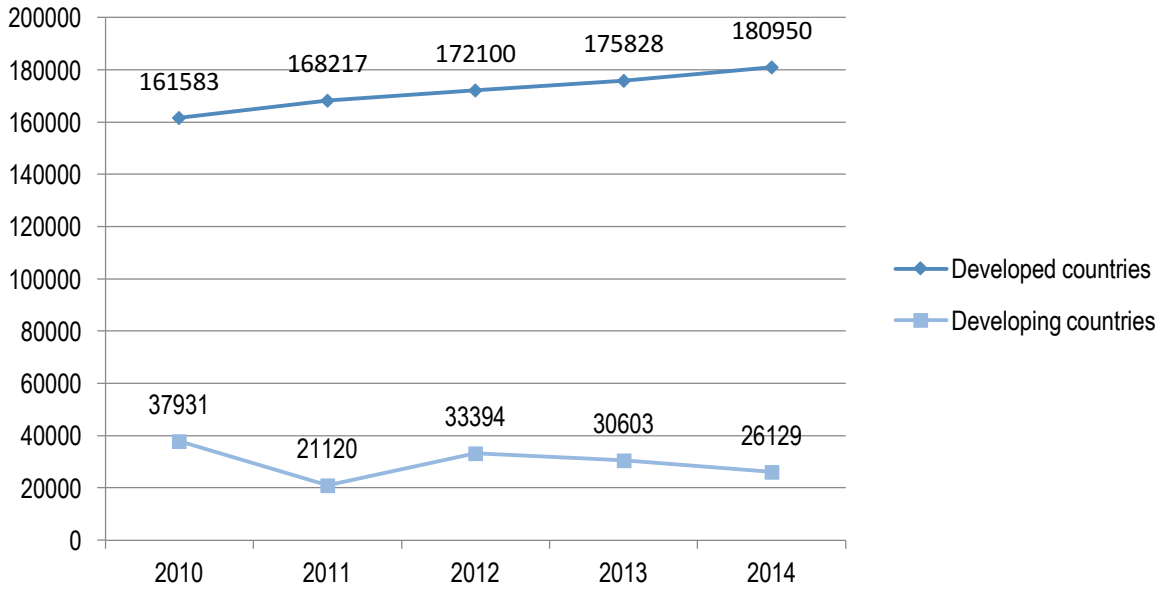
3. Analysis of disproportions of economic growth in the modern global economy

In order to evaluate the level and character of disproportions of economic growth in modern global economy, let us view dynamics of GDP and GDP per capita in developed and developing countries. For that, four countries are selected from each category. The group of developed countries includes economies which occupy leading positions in international rankings as to the level of economic development – USA, Germany, France, and Great Britain. The group of developing countries includes the largest (geographically) countries of Africa which occupy average and above average positions in international rankings – Libya, Sudan, Ethiopia, and Mauritania (Figure 1 and Figure 2).



Source: Dynamics of GDP of countries of the world…, 2015

Figure 1 - Graphical expression of disproportions of GDP of developed and developing countries in 2010-2014, $ billion



Source: (Dynamics of GDP of countries of the world…, 2015).

Figure 2 - Graphical expression of disproportions of GDP of developed and developing countries in 2010-2014, $ billion

As is seen from Figure 1 and Figure 2, GDP of developed and developing countries differ so much that they are difficult to be shown in the same graph. At present, there is a tendency for strengthening and deepening of disproportions in the global economic system. During period of the global economic crises, disproportions increase – *i.e.*, rich countries become richer, and poor countries become poorer.

As of 2014, total GDP of the selected developed countries constitutes $27,071 billion, developing – $137.74 billion. That is, GDP of developed countries is by 200 timed larger than GDP of the most successful developing countries. Taking into account the underdeveloped countries which occupy last positions in international rankings, the gap is even larger.

In 2014, GDP per capita in developed countries ($180,950) was by 7 times larger than GDP per capita in developing countries ($26,129). With growth of the number of population of developing countries and acceleration of rates of economic growth of developed countries, the gap between them grows. This shows the regularity of increase of disproportions of economic growth in modern global economy.

The most significant causes for these disproportions are initial position of developed countries in the period of formation of the global economic system, which they have been successfully holding over the recent centuries, low level of entrepreneurial and innovational activity of population of developing countries, etc.

Consequences of such disproportions are growth of social tension in developing countries, revolutions (as manifestations of wrong public belief into political causes of economic under run), large migration of the poorest groups of population from developing countries into developed countries, etc.

Over the recent decades, there have been active attempts for taking developing countries to the level of developed countries. As of now, these attempts have not led to any success – neither has the gap reduced, nor preserved at the same level, continuing to grow. Negative effectiveness shows uselessness of such attempts and their inexpedience.

4. New approach to treatment of the concept of balance of economic systems

As a result of analysis of disproportions of economic growth in the modern global economy, it is possible to conclude that balance in the global economy cannot be viewed from the point of view of macro-economic balance by Pareto, as situation, at which it is impossible to improve the position of certain economic subjects without aggravation of positions of others.

In the scale of the global economic system, it is better to describe the real situation with micro-economic curve of production capacities, which reflects impossibility for production volumes of one benefit (improvement of position of one country) without reduction of production volume of another benefit (aggravation of another country's position). Therefore, any situation in the global economy is equilibrium by Pareto. According to formal attributes, current situation in the global economy can be defined as equilibrium within the existing concept of balance of economic systems. However, events in the global economic system show the opposite.

Significant contradiction of trajectory of development of the global economic system to interests of its members is confirmed by multiple long revolutions in most of African countries, continuous flow of terroristic acts in the whole world, economic sanctions, etc. Balance of the global economic system cannot be viewed from the point of view of correspondence of production capacities to public needs. That is, volume of the global production cannot fully (or with a high level of closeness) correspond to the global demand for goods and services. Global balance cannot be reached according to macro-economic balance of demand and offer. In other words, all countries of the world cannot reach the same (or sufficiently close, comparable) level of economic development due to objective independent reasons, which are impossible to change.

Among such reasons, the most important role belongs to differences in geographical location and climatic conditions and socio-cultural peculiarities of the countries. This contradicts the possibility for realization of existing idea of achievement of well-balanced economic growth of various economic systems in the global economy. This proves the necessity for rethinking of the concept of balance of economic systems. As a new approach to treatment of the concept of balance of economic systems, this research offers the following. Global balance is a situation in the global economy, which is acknowledged by all (or at least, most part) members of international economic relations (Figure 3).

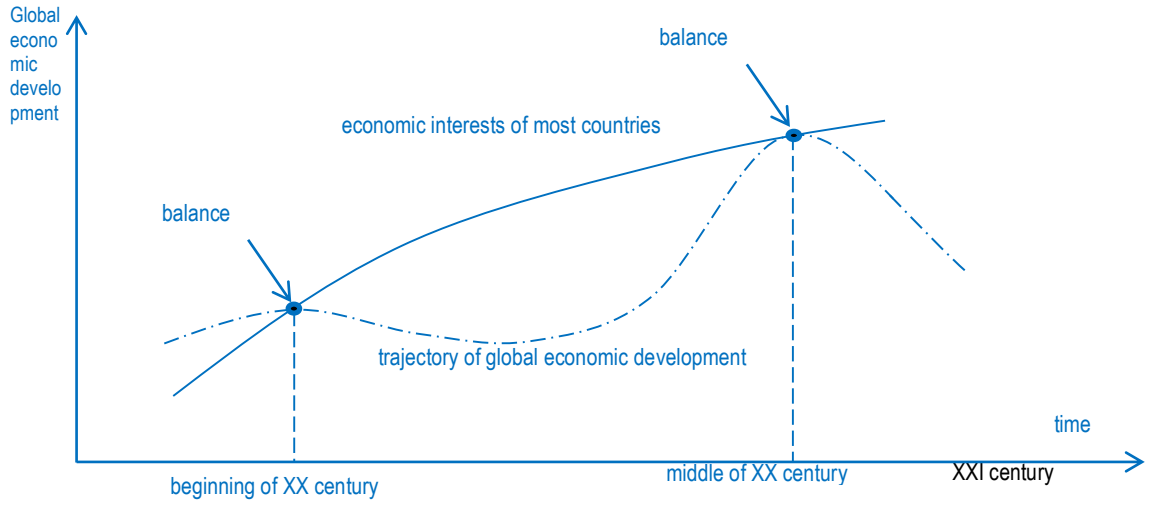


Figure 3 - Graphical expression of the balance of global economic system over the recent 100 years within the offered approach

As is seen from Figure 3, over the recent 100 years, two global economic balances were established in the global economy. At present, balance is violated, and economic interests of most of countries of the world significantly differ from trajectory of the global economic development.

Within the offered approach, balance is a balance of interests of various subjects of the global economy. Efficiency of such approach to treatment of the concept of balance of economic systems is proved by historical events in the global economy. Thus, during the period of colonies' and monopolies' prosperity at the end of XIX – beginning of XX century, the global economic balance was established – as the existing situation was acknowledged by most of countries.

In the period of announcement of the US economy as a landmark for the global economic development and of dollar as a global reserve currency in the middle of XX century, countries of the world agreed on this issue. In the following decades, there was balance in the global economy. Afterwards, it was violated due to many countries' realizing the utopian nature of copying foreign successful experience and practical impossibility for use of American experience with development of other economic systems, which led to contradiction and necessity for rethinking of the strategy of global economic development in view of development of unique trajectories of economic growth of various countries. Domination of American idea of establishment of absolute market freedom and perfect competition also came to an end – which is proved by alienation of American culture and lobbying US interests by countries of the world.

For establishment of new balance in the global economy, there's a necessity for search for solution of existing contradiction. This solution could be selection of a new pole of growth of the global economic system. This could be generally acknowledged economy, which would lead other economic systems.

It could also be a new approach to provision of economic growth, which corresponds optimally to modern economic reality and which would be accepted by countries of the world as a landmark for further development for several years or even decades.

Conclusions

The conducted analysis of disproportions of economic growth in the global economy allowed proving the offered hypothesis and proving that concept of balance of economic systems in its modern understanding is not applicable to analysis of the global economic system.

The authors substantiate the necessity for rethinking of the concept of balance of economic systems and prove that establishment of correspondence of the level of economic development of various countries of the world is impossible – moreover, during evolution of modern global economy, not only was the tendency of reduction of gap between levels of economic development of various countries observed, but there is a tendency of its deepening.

This shows a utopian nature of the very idea of one-size-fits-all approach to analysis of economic development of various economic systems due to large diversity of their peculiarities. Taking into account that there is a close interdependence between countries in the global economy, and total resources (as well as production factors and total income) are limited, any change always leads to improvement of position of certain countries and aggravation of position of others.

Based on this, the authors build a new formula of balance of global economic system, as a situation acknowledged and accepted by all (or at least, by most) members of international economic relations, and provide practical examples of such balance over recent 100 years.

The authors' conclusions have high theoretical significance, as they allow specifying the concept of balance of economic systems in view of peculiarities of the global economy, and high practical significance – as they could be applied during analysis of balance of global economic system and development of program of measures for its establishment and correction of existing programs for supporting the developing countries by the developed ones.

A sight limitation of scientific results, received during the research, is narrowness of time interval, over which the examples of global economic balance were studied (recent 100 years). Due to that, during further research in this sphere, it is necessary to pay more attention to consideration of such examples during the whole history of the global economy.

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Do Conventional and Islamic Stock Markets Subject to Different Market Anomalies? Empirical Evidences from Indonesia and Malaysia

M. Shabri ABD. MAJID[4]
Faculty of Economics and Business
Syiah Kuala University, Darussalam, Banda Aceh, Indonesia
mshabri@unsyiah.ac.id

Zulfa Alvi VAKHIRA
Faculty of Economics and Business
Syiah Kuala University, Darussalam, Banda Aceh, Indonesia

Salina KASSIM
Institute of Islamic Banking and Finance
International Islamic University Malaysia

Abstract:

This study aims to investigate whether the conventional and Islamic stock returns are subject to different calendar anomalies by testing the monthly calendar effects on stock returns in both markets. Focusing on the Indonesian and Malaysian Stock Markets, the closing monthly prices of the Jakarta Stock Exchange Index (JKSE), Kuala Lumpur Stock Exchange Index (KLSE), Jakarta Islamic Index (JII) and FTSE Bursa Malaysia Hijrah Shariah Index (FBMHS) were considered covering the period from 2004 to 2015. An independent sample of t-test is adopted to explore the differences between the conventional and Islamic stock returns in both countries, while the calendar effects of the stock returns is then tested using the multiple regression. The study finds that there were no differences between the conventional and Islamic stock returns, and the calendar anomaly is only existed in the Indonesian stock markets. This implies that although both the conventional and Islamic stock markets have been well integrated in both markets, the stock markets of Malaysia have been more efficient than the Indonesian counterpart.

Keywords: anomaly, monthly effect, Islamic capital market, conventional capital market, stock returns, Islamic finance.

JEL Classification: C32, C53, E44, G15.

1. Introduction

The capital market has been commonly used as one of the indicators of a country's economic progress as it essentially indicates the availability of long-term funding to support potential growth of the business sector. The stock market, in particular plays an important role in the economy since, in addition to its function as a means of funding for companies and other institutions, it also serves as a venue for investment.

Similar to other stock markets in the Asian countries, the stock markets in Indonesia and Malaysia have been progressing rapidly in recent decades as reflected by the continuous growth in the value of stocks, significant increase in the stock indices, transaction value and market capitalization, and more diversified investment products. The emergence of Islamic stocks in Malaysia at the end of 1999 and Indonesia in early 2003 was a period of phenomenal growth of stock markets in both countries. Since their inceptions, the Islamic stock markets continue to grow rapidly with increasing public awareness of conducting business and investment activities based on the *shari'ah*, which is free from the elements of interest (*riba*), uncertainty *(gharar)* and gambling (*maysir*) (Metwally 1997, Yusof and Majid 2007 and 2008, Majid and Kassim 2010, Yusof *et al.* 2011). Since then, Muslim investors can be more selective in investing their monies by not just looking at the rate of return and investment risk trade-off, but also considering the permissibility (*halal*) of investment so as to be in line with their religious belief.

Since the launch of the first Islamic stock market in Jordan in 1978, the world financial system experienced a drastic change with the Islamic stock market operating in parallel with the conventional stock market in several countries, including Malaysia and Indonesia. The Islamic finance industry has developed significantly ever since, especially during the 2008 global financial crisis and 2010 European debt crisis (Kassim and Majid 2010). Currently, the industry is no longer confined in the Muslim countries, but also in the western countries. Growing at a double-digit rate of around 15% per year, the Islamic finance industry has attracted the western countries to also introduce the Islamic stock market as an alternative investment avenue for the investors.

[4] Corresponding author

The presence of the Islamic stock market has enabled the Muslim investors to diversify their investments in financial assets that are permissible based on the Islamic tenets. Despite this, the investors are assumed to be guided by the normal risk-return consideration. According to Sharpe *et al.* (1999), investments in financial assets are the core activity in the capital market. Investment involves the sacrifice of the certain current value to gain uncertain future values. Investors expect to accumulate positive returns from their investments, considering risks-returns trade-off. Apart from the expectation of positive rate of return, investing in the stock market also has risks that are difficult to predict. In every investment made both in the Islamic and conventional stocks, investors who expect to gain higher returns should bear a higher level of risk. Thus, investors should diversify their investment in order to gain positive return with a minimal level of risks.

While investing in stocks, investors consider all available information related to the stock issuers and economy as a whole including published and unpublished information in order to minimize errors in deciding in which stocks they are investing. The right investment decisions also require information about the market and economic conditions at all possible levels, namely nationally, regionally and globally. The extent to which the stock market reacts quickly and accurately to achieve a new equilibrium stock price which fully reflects the information that is available, which is so-called as the efficient stock market (Choudhry 2001, Jogiyanto 2009, Ambarwati 2009, As'adah 2009, Karim and Majid 2009, Al-Jarrah and Basheer 2011, Chia and Khim 2012, Debasish 2012) is also need to be well-understood by the investors so that they could minimize the investment risks and gain maximum diversification benefits.

Previous studies on stock market anomalies worldwide documented mixed empirical findings. These studies, however, discovered the existence of anomalies in the stock markets with the findings contradicting the theory of efficient markets. Several similar studies conducted on the Indonesian and Malaysian markets have also discovered the existence of anomalies in the stock markets, but very small number of studies has examined the monthly effect of both conventional and Islamic stock markets. Comparing to the vast-growing of the Islamic stock markets in the countries, number of studies on the Islamic stocks have been far smaller than that of the conventional counterparts. This motivates the present study to fill up the existing researches' gap by empirically exploring the efficiency of Islamic stock markets in Indonesia and Malaysia, and at the same time, comparing them with the conventional stock markets. With reference to Worthington (2012), this study, specifically, attempts to empirically examine the differences in returns between the conventional and Islamic stocks, and investigate the existence of seasonality in the form of calendar anomalies in both conventional and Islamic stocks in Indonesia and Malaysia.

The rest of this study is organized in the following sequences. Section 2 reviews the selected previous literatures on the stock markets and their anomalies. Section 3 highlights the data and research method on which the analysis of the study is based. Section 4 discusses the findings of the study and provides their implications. Finally, Section 5 concludes the paper.

2. Calendar anomalies in the stock market

One of the major breakthroughs in the field of financial theory is the introduction of the Efficient Market Hypothesis (EMH) by Fama in 1970. The EHM has been seen as an important milestone in the development of financial theory and became a fundamental building block in the theory of finance (Smith 1990). Of the many financial theories, EMH has been given more attention and widely empirically tested by researchers in the context of the capital market worldwide (see, for example, Shanken and Smith 1996, Megginson 1997, Miller1999).

According to Fama (1970, 1991), the EMH suggests that an efficient market occur if securities prices accurately represents the information in the market. In particular, the speed of changes or adjustments in the securities prices would reflect all information available in the market, thus representing the level of stock market efficiency. The faster the markets react to new information, the more efficient is the market. Efficient market will only happen if prices change randomly (random walk theory) because it reflects the ever-changing information. Random walk theory, which was introduced by Kendall and Hill (1953) states that the movement of a stock would not follow any patterns or trends, thus the historical price movements could not be used to predict future price movements. Since the arrival of new information could not be predicted, then the price changes would also not be estimated, as the information presence is in random-walk fashion (Samuelson and Nordhaus 1995). In other words, if tomorrow price changes will fully reflect tomorrow information, but it has nothing to do with the changes in today's prices (Malkiel 2003). This implies that the investors would not possible to earn abnormal profit from their irrational behavior.

However, there are several empirical studies documented contradicting evidence to the EMH, where investors still could gain abnormal returns by investing the money in the right stocks using historical prices to

predict future stock returns, a condition known as "market anomaly". This anomaly would result in the erroneous prediction of the stock prices. The market anomalies were caused by the following reasons: (i) the imperfections of the market structure; (ii) behavioral biasness of investors in the market; and (iii) the inaccuracy of capital market theory in assessing capital market (Reilly and Norton 2006).

Calendar anomalies or seasonality are one of anomalies in the capital markets. These anomalies are related to the deviation of stock price movements associated with specific time series. More specifically, the January effect, monthly effect, turn-of-the month effect, time of the month effect, holiday effect, Monday effect, and day of the week effect are examples of calendar anomalies. These anomalies are documented in both developed and emerging stock markets. For example, Gultekin and Gultekin (1983) and Giovanis (2009) found that most stock markets in industrialized countries have seasonal effect in January (the January Effect), which was indicated by some abnormal returns gained by investors who invested their money in those stock markets in January. In their study, Keong *et al*. (2010) found that there were anomalies in different countries at the different months across the calendar period. In the same vein, using a multiple regression approach for the period from 1996 to 2008, Worthington (2012) found that the Australian stock market provided the highest rate of returns in April, July, and December within the companies with small capitalization.

Similar to those studies in the developed stocks markets, previous studies in the context of Indonesia also recorded the evidences of calendar effects. Siswanto (2001), Setyawasih (2009), Siswanto, and Setyawardhana (2005) found that there were significant positive returns on Friday compared to other days in the Indonesian stock market. Tjahjo and Handono (2003) also found the price to earnings ratio anomalies in the Indonesian capital market. Wiksuana (2008) further found the presence of the winner-loser anomaly among the individual and industrial stocks in Indonesia. Furthermore, Manurung and Permana (2005) in his research about the overreaction anomaly, found an anomaly over reaction of the LQ-45 stocks during the period 2002-2005. In short, the findings of these studies support the presence of anomalies in the stock market, indicating that the markets were inefficient (Levy 2002), thus contradicting the proposition put forward by the EMH.

Based on the above review, most of the earlier studies on calendar anomalies have focused on the conventional stock markets, and none of the studies has investigated the Islamic stock markets' anomalies. Since none of the studies on this issue has explores the calendar anomalies in both conventional and Islamic stock markets in Indonesia and Malaysia, thus this study tries to fill the existing gap in the literatures by providing evidences on stock market's calendar anomalies both conventional and Islamic in Indonesia and Malaysia with a comparative treatment.

3. Data and empirical framework

Monthly closing stock prices from the period 2004 to 2015 were analyzed in the study. These data were gathered from the websites of the Jakarta Stock Exchange and the Bourses of Malaysia. As for the conventional stock prices, the Jakarta Stock Exchange (JKSE) and the Kuala Lumpur Stock Exchange (KLSE) indices were respectively utilized for the conventional stocks of Indonesia and Malaysia, while the Jakarta Islamic Index (JII) and the FTSE Bursa Malaysia Hijrah Shariah Index (FBMHS) were adopted for the Islamic stocks for Indonesia and Malaysia, respectively.

The stock returns of both Islamic and conventional stocks in both countries were used as the dependent variable in this study, which is calculated by:

$$R_t = (P_t - P_{t-1}) / P_{t-1} \quad (3.1)$$

where R_t is the stock returns at the month *t*, P_t is the closing stock prices at the month *t*, and the P_{t-1} is the closing stock prices of the earlier months.

Meanwhile, the monthly effects (*i.e.,* the stock returns of January, February, March, April, May, June, July, August, September, October and December) were treated as the independent variables.

In this study, the independent sample t-test is used to empirically examine the mean differences between the conventional and Islamic stock returns in both countries, Indonesia and Malaysia. However, before the independent sample t-test was conducted, the study ensures first whether the returns from both conventional and Islamic stocks are having equal or unequal variances, using the Levene Test. Then, the t-test used for determining the differences in stock returns between the conventional and Islamic stocks, is in accordance to the finding from the Levene Test.

Meanwhile, the multiple regression was adopted to explore the presence of calendar anomalies on both stocks in both countries. In this regression model, the independent variables consisting of dummy variables to

assess the movements of those stock returns across months during the period of analysis. Two following multiple regression models were adopted to empirically assess the existence of calendar anomalies in the conventional and Islamic stocks, respectively.

$$R_{tc}=\alpha+\beta_1 DJan+\beta_2 DFeb+\beta_3 DMar+\beta_4 DApr+\beta_5 DMay+\beta_6 DJun+\beta_7 DJul+\beta_8 DAgt+\beta_9 DSept+\beta_{10} DOct+\beta_{11} DNov+\beta_{12} DDec+ e_t \quad (3.2)$$

$$R_{ti}=\alpha+\beta_1 DJan+\beta_2 DFeb+\beta_3 DMar+\beta_4 DApr+\beta_5 DMay+\beta_6 DJun+\beta_7 DJul+\beta_8 DAgt+\beta_9 DSept+\beta_{10} DOct+ \beta_{11} DNov+\beta_{12} DDec+ e_t \quad (3.3)$$

where R_{tc} and R_{ti} are the returns for the conventional and Islamic stocks at the month *t,* respectively. β_1, β_2, ... β_{12} are the estimated regression coefficients for *dummy* variables at each month, *DJan* is the *Dummy* for January, *DFeb* is the *Dummy* for February, *DMar* is the *Dummy* for March, *DApr* is the *Dummy* for April, *DMay* is the *Dummy* for May, *DJun* is *Dummy* for June, *DJul* is the *Dummy* for July, *DAgt* is the *Dummy* for August, *DSept* is the *Dummy* for September, *DOct* is the *Dummy* for October, *DNov* is the *Dummy* for November, *DDec* is the *Dummy* for December, and e_{tt} is the *error term.*

To explore the monthly effect of January on the both stock returns in both countries, for example, the value of 1 is given for the *DJan* and value of 0 is given for the other months and so on. Since both conventional and Islamic stocks in Indonesia and Malaysia were empirically investigated, thus the regression analysis would be conducted twice for each country, *i.e.* one for the conventional stocks and one for the Islamic stocks.

In addition, before the data are further analyzed, the classical assumption comprising tests of normality, multicollinearity, autocorrelation, and heteroscedasticity were conducted in order to produce a robust finding in this study. A non-parametric test of Kolmogorov-Smirnov (K-S) is used to test the normality. If the value of Kolmogorov-Smirnov test is greater than the selected significant level, then the data is found to be normally distributed (Gujarati 2009). As for the multicollinearity test, the Tolerance Value (TV) and Variance Inflation Factor (VIF) are used. If the TV is greater than 0.1 or the VIF is smaller than 10, thus the data are free from the multi-collinearity problem. The Durbin-Watson (D-W) test is adopted to check for the autocorrelation, where if the D-W value is around 2, then the data is said to be free from the autocorrelation problem. Finally, the Glejser test is used to test for the heteroscedasticity of the data.

4. Findings and discussion

It this section, we provide the findings of the study. The findings of the independent sample t-test to present the differences in stock returns between conventional and Islamic in Indonesia and Malaysia would be presented first before the findings of the calendar anomalies in both stocks in both countries. However, before those findings were reported, the descriptive statistics on the stocks would be firstly presented.

4.1. Descriptive statistics of the conventional and Islamic Stock Returns

Table1 reported the descriptive statistics of conventional and Islamic stock returns in Indonesia and Malaysia, respectively. During 2004 to 2015, the highest average stock returns were found in the Indonesian conventional stock market (JKSE) by 1.75%, followed by the Indonesian Islamic stocks (Jakarta Islamic Index - JII) by 1.60%. meanwhile, the lowest average stock returns were found the conventional Malaysian stocks (KLSE) by 0.79%, followed by the Malaysian Islamic stocks (FBMHS) by 0.98%. Comparing the performances of the conventional stocks to their Islamic counterparts in both countries, there was a difference by 0.15% between the conventional and Islamic stocks in Indonesia, and a difference by 0.19% between the Islamic and conventional stocks in Malaysia. These findings seem to show that the conventional stocks provided higher returns in Indonesia than in Malaysia.

Furthermore, the returns offered by both stock markets were different across the months, which showed by different standard deviations. The conventional and Islamic stock markets of Indonesia were found to be more volatile as compared to the stock markets of Malaysia. In other words, investing in the Indonesian stock markets is riskier than investing in the stock markets of neighboring country.

Table 1 -Descriptive statistics of the conventional and Islamic stock returns in Indonesia and Malaysia

Conventional Stock Returns					
	Month	Minimum	Maximum	Mean	Std. Deviation
Indonesia	January	-0.0794	0.0882	0.0120	0.0516
	February	-0.0354	0.0768	0.0110	0.0319

	March	-0.1009	0.1155	0.0327	0.0631
	April	-0.0583	0.2013	0.0501	0.0760
	May	-0.0917	0.1126	-0.0014	0.0702
	June	-0.0492	0.0573	0.0099	0.0351
	July	-0.0432	0.1462	0.0463	0.0534
	August	-0.1118	0.0589	-0.0349	0.0528
	September	-0.1539	0.1360	0.0300	0.0845
	October	-0.3142	0.1205	0.0006	0.1187
	November	-0.0563	0.1362	0.0154	0.0577
	December	0.0041	0.0917	0.0386	0.0264
	Mean	-0.0908	0.1118	0.0175	0.0601
Malaysia	January	-0.0363	0.0849	0.0062	0.0349
	February	-0.0257	0.0736	0.0095	0.0280
	March	-0.0809	0.0421	0.0037	0.0400
	April	-0.0705	0.1354	0.0208	0.0531
	May	-0.0455	0.0538	-0.0000	0.0307
	June	-0.0701	0.0320	0.0044	0.0294
	July	-0.0197	0.0926	0.0219	0.0338
	August	-0.0726	0.0452	-0.0172	0.0387
	September	-0.0743	0.0489	0.0055	0.0370
	October	-0.1522	0.0755	0.0104	0.0624
	November	-0.0372	0.0934	0.0085	0.0402
	December	-0.0106	0.0485	0.0206	0.0178
	Mean	-0.0580	0.0689	0,0079	0.0372
Islamic Stock Returns					
Indonesia	January	-0.1039	0.0781	0.0097	0.0578
	February	-0.0326	0.0671	0.0157	0.0333
	March	-0.1189	0.1058	0.0251	0.0652
	April	-0.0492	0.1819	0.0455	0.0726
	May	-0.0882	0.1068	-0.0075	0.0713
	June	-0.0257	0.0543	0.0163	0.0297
	July	-0.0987	0.1983	0.0405	0.0795
	August	-0.1007	0.0503	-0.0352	0.0440
	September	-0.1957	0.1113	0.0176	0.0905
	October	-0.3237	0.1583	0.0038	0.1271
	November	-0.0583	0.1535	0.0201	0.0698
	December	0.0066	0.1047	0.0388	0.0303
	Mean	-0.0991	0.1143	0.0160	0.0643
Malaysia	January	-0.0388	0.0803	0.0089	0.0357
	February	-0.0104	0.0753	0.0121	0.0261
	March	-0.1102	0.0610	0.0031	0.0481
	April	-0.0841	0.1272	0.0241	0.0571
	May	-0.0588	0.0524	0.0038	0.0360
	June	-0.0586	0.0275	0.0019	0.0282
	July	-0.0753	0.0830	0.0184	0.0421
	August	-0.0697	0.0355	-0.0161	0.0404
	September	-0.0817	0.0937	0.0071	0.0451
	October	-0.1451	0.0838	0.0151	0.0630
	November	-0.0463	0.1010	0.0134	0.0412
	December	-0.0039	0.0624	0.0254	0.0251
	Mean	-0.0652	0.0736	0.0098	0.0407

4.2. Differences in returns between the conventional and Islamic stock markets

Before the main findings of the study were presented, the classical assumptions of normality, multicollinearity, autocorrelation and heteroscedacity were firstly tested. The study found that all the classical assumption tests provided the findings that the data analyzed in this study were normally distributed, non-

multicollinearity, no-autocorrelation and homoscedastic.[5] These indicated that all the classical assumptions were fulfilled in the study, thus the data could be utilized for further analysis in the paper.

Table 2 provides the findings of independent sample t-test of mean differences between the conventional and Islamic stock returns in Indonesia and Malaysia. Since the variances between the conventional stocks of Indonesia (JKSE) and Malaysia (KLSE); the Islamic stocks of Indonesia (JII) and Malaysia (FBMHS); the conventional stocks of Indonesia (JKSE) and the Islamic stock of Malaysia (FBMHS); and the conventional stocks of Malaysia (KLSE) and the Islamic stock of Indonesia (JII) were found to be unequal, thus tests of mean differences between these markets were conducted using the independent sample t-test of unequal variances. On the other hand, the independent sample t-test of equal variances was used to test the mean differences between the conventional (JKSE) and Islamic (JII) stock markets of Indonesia; and between the conventional (KLSE) and Islamic (FBMHS) stock markets of Malaysia since the different variances between the two markets were found to be equal. Having identified the forms of the variances between the stock markets, both Islamic and conventional across two countries, then the study proceeds to examine the mean differences of stock returns between those markets. The study documented that there was no statistically significant difference between the stock returns in the two countries, both conventional and Islamic. Although the returns were shown to be different, they were statistically indifference. In other words, the differences between the stock returns were mainly due to sampling error.

Table 2 -Mean differences in returns between conventional and Islamic Stocks in Indonesia and Malaysia

Tests of mean differences across the stocks	Equal variances assumed/Equal variances not assumed		
	t-test	Sig.	Sig. (2-tailed)
JKSE versus KLSE	1.386	0.000	0.617
JII versus FBMHS	0.819	0.000	0.414
JKSE versus FBMHS	1.085	0.000	0.279
KLSE versus JII	-1.101	0.000	0.272
JKSE versus JII	0.188	0.617	0.851
KLSE versus FBMHS	-0.373	0.536	0.709

Note: JKSE (Jakarta Stock Exchange Index) and KLSE (Kuala Lumpur Stock Exchange Index) represent the Indonesian and Malaysian conventional stocks, respectively; while the JII (Jakarta Islamic Stock Index) and FBMHS (FTSE Bursa Malaysia Hijrah Shariah Index) represent the Indonesian and Malaysian Islamic stocks, respectively.

This finding was supported by Subaweh (2008), who found that the performance of conventional and Islamic financial institutions *(i.e.,* banks) in Indonesia was statistically insignificance. The similar returns provided by both Islamic and conventional stocks are simply due to most of the stocks listed under the conventional stocks' list were part and parcel of Islamic stocks. At least, 80% of the stocks listed in the conventional stock markets were the Islamic stocks. This finding further implied that investing in both markets, Islamic and conventional, in both countries provided similar returns. Although the both Islamic and conventional stocks provided no different returns, but as for Muslim investors they should opt to invest their money in Islamic stocks since it is in harmony with the Islamic principles. Islamic stocks are free from the elements of *riba*, *gharar,* and *maysir*, which are strongly prohibited in Islam.

Furthermore, the similar level of returns offered by both Islamic and conventional stocks in the two countries could be due to the higher integration between the markets in both countries. This showed that the Islamic and conventional stock markets in both countries have been moving towards a more integrated. *When* the markets become more integrated, then both markets would show the same trend for each country. In other words, the pattern of increase or decline would occur simultaneously or nearly simultaneously. This finding supported the previous study' finding by Lim *et al*. (2003), who found that the stock markets of Indonesia, Malaysia, the Philippines, and Thailand have been more integrated.

4.3. Findings for calendar anomalies in the conventional and Islamic Stock markets

The multiple regression technique with dummies is used to test the presence of the calendar anomalies in both the Islamic and conventional stock markets in Indonesia and Malaysia, where their findings are presented in Table 3.

Due to space limitation, the findings of classical assumption tests were not reported here. However, the findings are available with author upon request.

Table 3 - Findings of calendar anomalies in conventional and Islamic stock markets

Model	Conventional Stock Markets				Islamic Stock Markets			
	Indonesia		Malaysia		Indonesia		Malaysia	
	Dummy	*p*-value	Dummy	*p*-value	Dummy	Sig.	Dummy	*p*-value
Constant	-0.001	0.941	-0.005	0.996	-0.006	0.733	0.003	0.774
January	0.004	0.894	0.004	0.836	0.011	0.742	0.001	0.956
February	0.010	0.738	0.002	0.601	0.021	0.490	0.007	0.699
March	0.033	0.228	0.004	0.829	0.032	0.287	-0.001	0.956
April	0.051	0.035*	0.021	0.179	0.053	0.049*	0.020	0.219
May	0.012	0.315	0.243	0.789	0.022	0.389	0.202	0.487
June	0.011	0.637	0.005	0.771	0.024	0.371	-0.002	0.910
July	0.048	0.085**	0.022	0.200	0.048	0.112	0.015	0.425
August	-0.033	0.243	-0.017	0.323	-0.028	0.372	-0.020	0.289
September	0.032	0.276	0.006	0.749	0.025	0.419	0.003	0.860
October	0.022	0.941	0.011	0.547	0.011	0.715	0.011	0.551
November	0.017	0.559	0.009	0.621	0.028	0.377	0.010	0.614
December	0.040	0.167	0.021	0.237	0.046	0.140	0.022	0.255
Adjusted-R^2	0.179		0.092		0.089		0.086	

Note: * and ** indicate significance at the levels of 5% and 10%, respectively; and R^2 is the coefficient of determination

The findings from Table 3 showed that there was no monthly effect on the returns of both conventional and Islamic stock markets of Malaysia Islamic. Contradicting to the finding on the Indonesian stock markets, the study documented that there were monthly effects on the returns of both conventional and Islamic stock markets in Indonesia. Specifically, there were monthly effects of April and July on the returns of the Indonesian conventional stocks at the 5% and 10% significant levels, respectively. Meanwhile, the monthly effect of April was significantly recorded at the 5% significant level in the returns of the Islamic stock market in Indonesia. The higher volatilities of the Indonesian stock markets as compared to their neighboring stock markets seemed contributed to the presences of the calendar anomalies in both conventional and Islamic stock markets in Indonesia.

The presence of monthly effects in the months of April and July in the Indonesian stock markets could be due to several factors, among others, namely: The provision of the Capital Market Supervisory Agency, No.80/PM/1996, which stated that the annual report should be accompanied by an auditor's report with unqualified opinion and submitted to the Capital Market Supervisory Agency 120 days after the date of the closing of financial report of the company. This means that April is the dateline for financial report should be submitted by the companies to the agency. Additionally, April was the month with many national days, such as the Day of World Bank, the International Health Day, the Kartini Day, the Earth Day, the Indonesian Prison Day (*Hari Pemasyarakatan Indonesia*). Meanwhile, the calendar anomaly occurred in July was simply due to events of increase in world oil prices, decline in crude oil prices in Indonesia, the bombing of JW Marriotts and the Ritz-Carlton tragedy on July 17, 2009, the new school academic year, the Day of Indonesian Central Bank (*Bank Indonesia*), Children's National Day, the Day of National Youth Committee (*Komite Pemuda Indonesia*).

This finding of calendar anomaly in the months of April and July in the stock markets of Indonesia was consistent with the findings of Sanjoko (2013) and that of Worthington (2012) in the stock market of Australia where the Australian stock market had offered higher returns in the months of April, July, and December.

Furthermore, the discovery of the phenomenon of monthly effect on the Indonesian stock markets, both conventional and Islamic during the observation period indicated that the Indonesian market was in the weak-form inefficiency. This implied that the stock returns in the Indonesian stock market have appeared to form a certain pattern. In other words, the movements of the future stock prices in the Indonesian inefficient markets could be predicted by using the historical stock prices. It also showed that the pattern of stock returns in April and July seemed to have certain characteristics. Thus, investors could learn the pattern of stock returns as one of the trading strategy to gain maximum diversification benefits.

Finally, the non-existence of calendar anomaly in the Malaysian stock markets, both conventional and Islamic, further implied that although both the conventional and Islamic stock markets have been well integrated in both countries, but the stock markets of Malaysia has been more efficient than the Indonesian counterpart.

Conclusion

This study empirically investigated the differences in returns between conventional and Islamic stock

markets both in Indonesia and Malaysia. It also attempted to test the monthly effects on stock returns in both markets, covered the period 2004 to 2015. Closing monthly prices of the Jakarta Stock Exchange Index (JKSE), Kuala Lumpur Stock Exchange Index (KLSE), Jakarta Islamic Index (JII), and the FTSE Bursa Malaysia Hijrah Shariah Index (FBMHS) were utilized. An Independent sample of t-test was adopted to explore the differences between the conventional and Islamic stock returns in both countries, while the calendar effects of the stock returns was then tested using the multiple regression with dummy variables.

The study documented that there were no statistical differences in returns between the conventional and Islamic stock markets in both countries. This finding implied that the conventional and Islamic stock markets in both countries has been well-integrated, having the similar patterns in the stock prices movements both in conventional and Islamic stocks in both countries. This further implied that investors who investing their monies in both markets would gain similar diversification benefits. As for Muslim investors, buying conventional stocks are against the Islamic injunctions as it is contained elements *riba*, *gharar,* and *maysir* that are totally prohibited in Islam.

In addition, the study also found that there were calendar anomalies in both conventional and Islamic stock markets in Indonesia, but not in the neighboring stock markets. Specifically, there were monthly effects of April and July on the returns of the Indonesian conventional stocks, while the monthly effect of April was recorded in the Indonesian Islamic stock market. This implies that although both the conventional and Islamic stock markets have been well integrated in both markets, but the stock markets of Malaysia has been more efficient than the Indonesian stock markets.

The findings of the study are based on the methodology outlined above. The differences in returns between Islamic and conventional stock markets and the existence of calendar anomalies on both markets were empirically explored. For a more reliable and robust finding, further studies should also compare the differences in risks between those markets. Additionally, further studies should examine other type of anomalies and at the same time identify the factors contributing the presence of the calendar anomalies in markets. Covering broader range of the Islamic and conventional stock markets worldwide is also recommended.

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Tax Administrative Costs in V4 Countries

Ivana ONDRIJOVÁ
University of Prešov, Faculty of Management[6], Slovakia
ivana.ondrijova@smail.unipo.sk

Roman VAVREK
University of Prešov, Faculty of Management, Slovakia
roman.vavrek@unipo.sk

Jaroslav KOREČKO
University of Prešov, Faculty of Management, Slovakia
jaroslav.korecko@unipo.sk

Alžbeta SUHÁNYIOVÁ
University of Prešov, Faculty of Management, Slovakia
alzbeta.suhynyiova@unipo.sk

Abstract

Main aim of this paper is to identify trends and differences between V4 countries. There are selected three categories of Tax Administrative costs which include information technology operations (IT), human resource management (HRM) and total administrative costs. To the description of result there are used several moment characteristics (average, range, etc.). Relationships between variables are tested by coefficient of variation, Pearson correlation, One-way analysis of variance and Kruskal-Wallis test. Based on statistical analysis can be stated that in the chosen period the administrative cost structure in V4 countries is variant.

Keywords: tax administration, costs, V4, statistical analysis.

JEL Classification: H20, H21.

1. Introduction

An effective tax system could be considered as a system that produces the lowest tax burden and causes low administrative costs at the highest tax revenues. Administrative costs are costs incurred by the tax authority in establishing and operating systems to manage all aspects of taxation. (Shaw *et al.* 2010) Kubátová (2010, 45) explains that the transfer of funds from the tax payers to the state budget requires for expenditures for its implementation and it causes inefficiency. The aim of tax system is to minimize this inefficiency. Costs of collection of taxes on the part of government are called direct administrative costs. This includes all costs of state administration for organizing the tax system for the registration of tax payers, tax collection, and control and so on. These are all the costs of the public provided those concern the tax system (*eg*. Costs Statistical Office to obtain information for tax authorities, the cost of justice services for tax administrator). Direct administrative costs are relatively easy to detect, since their entries are registered in the relevant state institutions (Kubátová 2010, Zubaľová 2008).

2. Methodology

In our research, we have used data from OECD study Tax Administration 2015. For our purpose, we have selected three categories of Tax Administrative costs which include information technology operations (IT), human resource management (HRM) and total administrative costs. For first two areas OECD survey sought data concerning: (1) Information technology operations: Actual or estimated costs of providing all information technology support for administrative operations; and (2) Human resource management functions: Actual or estimated costs of providing all human resource management support functions (*e.g.* personnel, payroll, recruitment, learning and development) for administrative operations (OECD 2015, 175).

For our purposes of comparison V4 countries in Tax administrative costs area we have firstly analyzed their GDP and subsequently performed analyzes with this indicator. Conclusions are made on basis of the results of statistical analyzes. The aim of this contribution is to identify trends and differences between V4 countries according to further indicators:

[6] Konštantínova 16, 080 01 Prešov, Slovakia

- total administrative costs/GDP (%), 2005-2013,
- HRM costs /total administrative costs (%), 2007-2013,
- IT costs/total administrative costs (%), 2009-2013.

Methods used in work define several authors as Anděl (2007), Pacáková *et al.* (2009), Markechová, Tirpáková, Stehlíková (2011). To the description of result we use several moment characteristics (average, range, etc.). Relationships between variables are tested by coefficient of variation, Pearson correlation, One-way analysis of variance and Kruskal-Wallis test which are more described below. The coefficient of variation for a single variable aims to describe the dispersion of the variable in a way that does not depend on the variable's measurement unit. The higher the coefficient of variation is, the greater the dispersion in the variable.

$$v_K = \frac{s_x}{\bar{x}} \tag{2.1}$$

with: s_x - standard deviation of variable x, $\bar{x}$ - average of variable x.

The Pearson product-moment correlation coefficient is a measure of the strength of the linear relationship between two variables. It is referred to as Pearson's correlation or simply as the correlation coefficient.

$$r = \frac{\overline{xy} - \bar{x}\bar{y}}{s_x s_y} = \frac{\frac{1}{n}\sum_{i=1}^{n} x_i y_i - \bar{x}\bar{y}}{\sqrt{(\frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2)(\frac{1}{n}\sum_{i=1}^{n}(y_i - \bar{y})^2)}} \tag{2.2}$$

with: n - number of observations; s_x - standard deviation of variable x; s_y - standard deviation of variable y; x_i - value of i-th unit of variable x; y_i - value of i-th unit of variable y; $\bar{x}$ - average of variable x; $\bar{y}$ - average of variable y

As the first choice to test differences between countries we use *One-way analysis of variance*:

$$F = \frac{MSA}{MSE} = \frac{\frac{SSA}{k-1}}{\frac{SSE}{n-k}} = \frac{\frac{\sum_{i=1}^{k}(\overline{y_i} - \bar{y})^2 n_i}{k-1}}{\frac{\sum_{i=1}^{k}\sum_{j=1}^{n_i}(y_{ij} - \overline{y_i})^2}{n-k}} \tag{2.3}$$

with: MSA - pooled variance obtained by combining the individual group variance, MSE - estimate of in the absence of true group effects.

The conditions of ANOVA (normality and homoscedasticity) are tested by Levene test and Goodness of Fit test. In case of rejection of at least one of the mentioned conditions is used automatically Kruskal-Wallis test

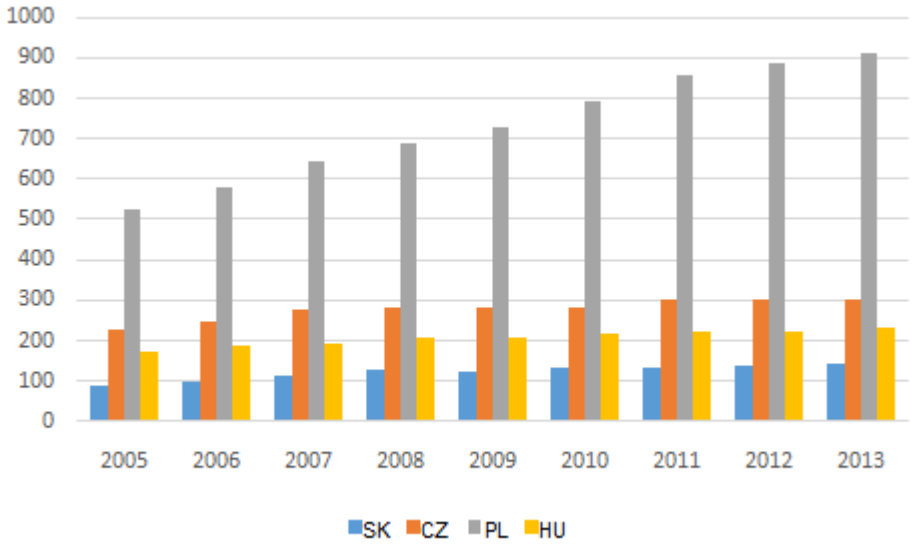
$$Q = \frac{12}{n(n-1)}\sum_{i=1}^{I}\frac{T_i^2}{n_i} - 3(n+1) \tag{2.4}$$

with: n - number of total observation; n_i - number of observation in i-th group; T_i^2 - total rank of the sample size of i-th group

Analyses are made in the Excel and statistical software Stat graphics and Statistica.

3. Gross domestic product in V4 countries

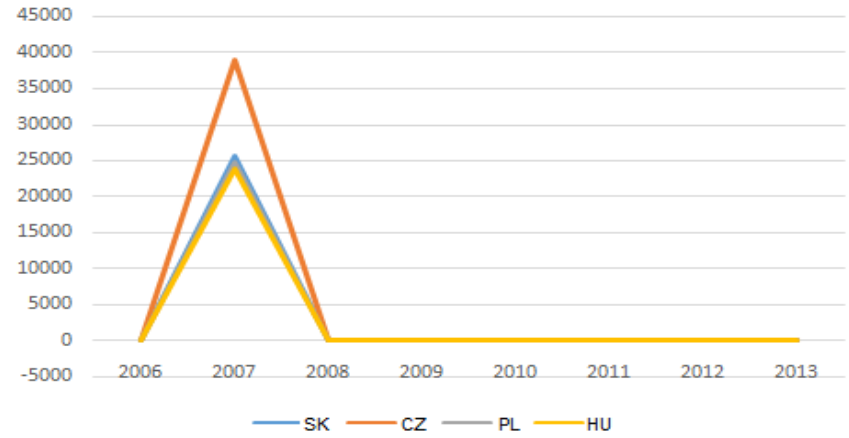
This section is devoted to GDP and population growth in all V4 countries and to this development among these countries compared by GDP per capita. Tendency in comparing the absolute values of GDP in individual V4 countries is documented in Figure 1. The most balanced economy is the Czech Republic, which documents the lowest coefficient of variation (V_K = 9.02 %), so we can assume also the smallest increase for nine years observed. In all countries, we can observe a negative slope (more above average evaluated years). The density around the mean value is the highest in the Czech Republic (β = 0.819), a result of the above mentioned lower variability.



Source: Own processing according to OECD Study

Figure 1 – GDP in billion USD, 2005 – 2013

In absolute terms, from the Figure 1 can be identified mainly Poland's GDP growth, which for nine years has increased by 72.48%. Due to this dominance (in absolute terms) the development in other countries is not graphically distinct. Slovakia has reached the second highest average GDP growth (x =6:34 %) in the period and fall behind Poland by 0.7% (Figure 2). Due to the imbalance of economic results we evaluate GDP growth in Slovakia as GDP growth with the highest margin of variation at the same time. Poland had the most balanced growth, GDP growth in Hungary and the Czech Republic was on average equal ($\Delta\bar{x}$ = 0.05).



Source: Own processing according to OECD Study

Figure 2 – Annual changes in GDP (%), 2006- 2013

The same domination of Poland can be observed in the population of the V4, which is the most populous nation. The absolute increase of population is minimal while the fastest growth in the average number of inhabitants was in Czech Republic ($\bar{x}$ = 0.33 %). Only in Slovakia we can observe a constant growth trend (Figure 3), while the population of Hungary fell by 193000 in the period, as the only from V4 countries.

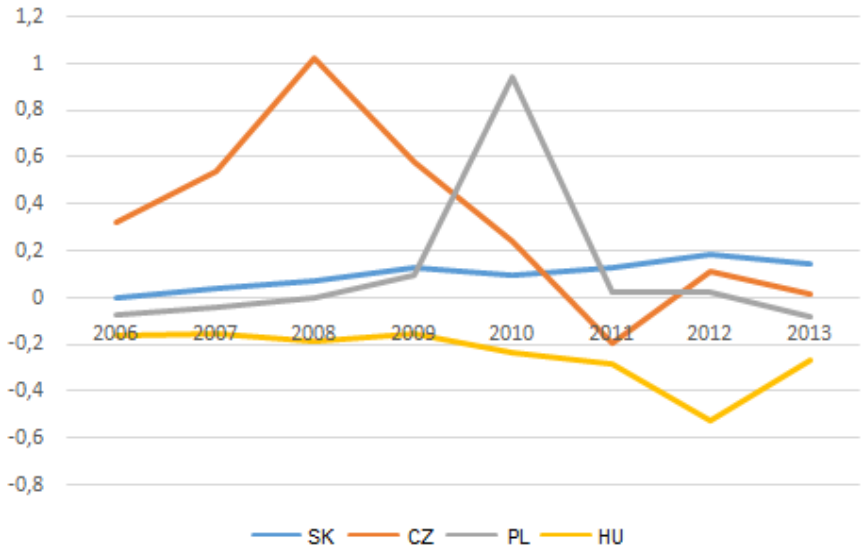


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Figure 3 – Annual percentage changes in the population of V4, 2006- 2013

Figure 4 shows the indicator GDP per capita and its comparison within V4 countries and there is no more the Poland domination. The country with the highest GDP per capita in each year was the Czech Republic and therefore it is also the country with the highest average ($\bar{x}$ = 26.69 bn. USD per capita). When comparing this indicator, the Czech Republic is also the country with the most balanced GDP per capita within V4 countries (V_K = 8.11 %); β = 1.05). On the other hand, indicator GDP per capita is the most heterogeneous in Poland (VK = 18.21 %, β = -1.29) but during nine years we can see in Poland the highest average growth ($\bar{x}$ = 6.96).

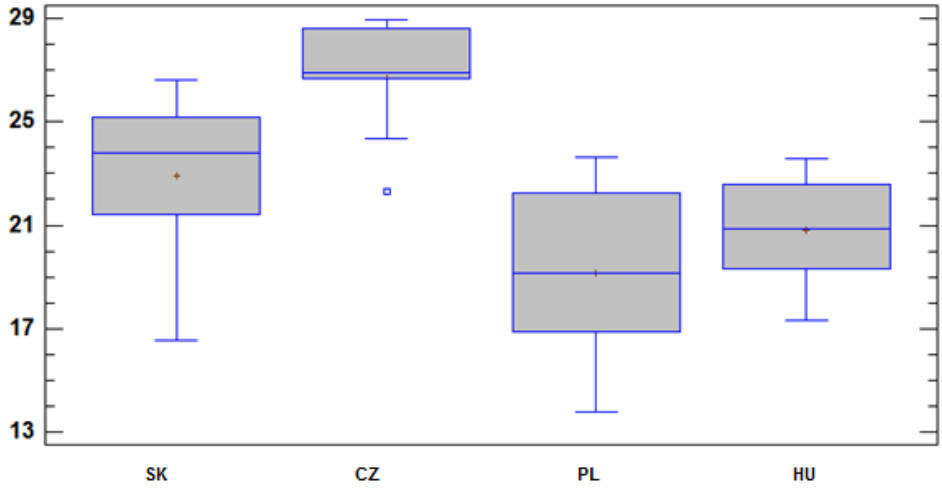

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Figure 4 – Comparison of GDP per capita in bill. USD V4, 2005-2013

The difference between GDP per capita within V4 countries, which captures Figure 4 is demonstrated by one-way analysis of variance, *i.e.* between countries there is statistically significant difference at the level of GDP per capita. Despite outliers (in 2002) Levene test (LE=1.753; p=0.176) and good correlation test confirmed the ANOVA assumptions. As significantly different we can call GDP per capita in the Czech Republic.

Table1 – ANOVA - the difference in GDP per capita in the bill. USD of V4

Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Between groups	284.449	3	94.8165	11.73	0.0000
Within groups	258.666	32	8.08331		
Total (Corr.)	543.115	35			

Source: Own calculations

The V4 countries are neighboring to each other, they significantly interact and therefore in terms of linear correlation there is almost perfect correlation among the indicators GDP per capita (Table 2).

Table 2 – correlation matrix - GDP per capita in the bill. USD of V4

	SK	CZ	HU	PL
SR		0.9743	0.9797	0.9597
p		0.0000	0.0000	0.0000
CR	0.9743		0.9471	0.9318
p	0.0000		0.0001	0.0003
HU	0.9797	0.9471		0.9865
p	0.0000	0.0001		0.0000
PL	0.9597	0.9318	0.9865	
p	0.0000	0.0003	0.0000	

Source: Own calculations

When comparing the absolute values (GDP, population) we note the dominance of Poland as a country with the largest area and population. When comparing V4 countries by GDP per capita the highest ranked country is Czech Republic with the highest GDP per capita and at the same time over the 8 years it is the most balanced.

4. Tax Administration costs in V4 countries

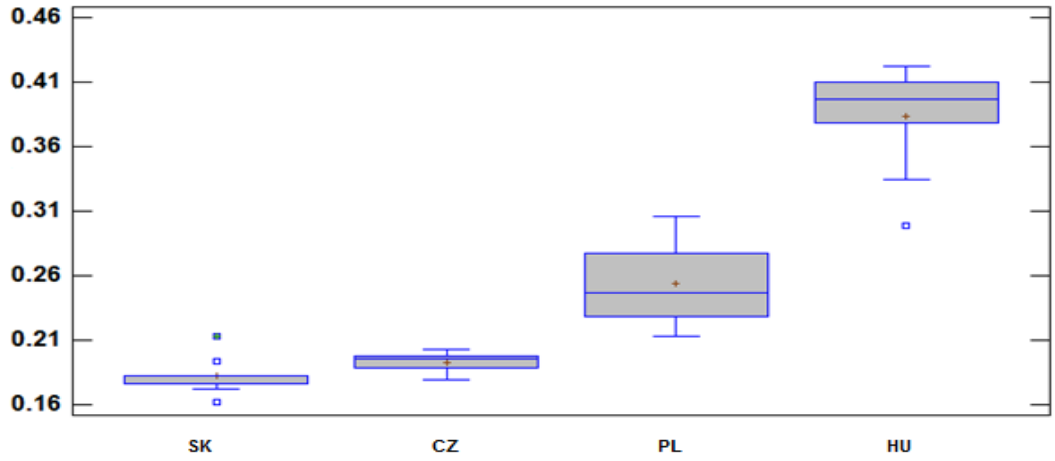
The total administrative costs are within this subchapter analyzed at three levels:

- total administrative costs/GDP (%), 2005 - 2013,
- HRM costs /total administrative costs (%), 2007 - 2013,
- IT costs/total administrative costs (%), 2009 - 2013.

The analysis is based on available data, in relative terms, and these data are processed separately available for the period.

Total administrative costs

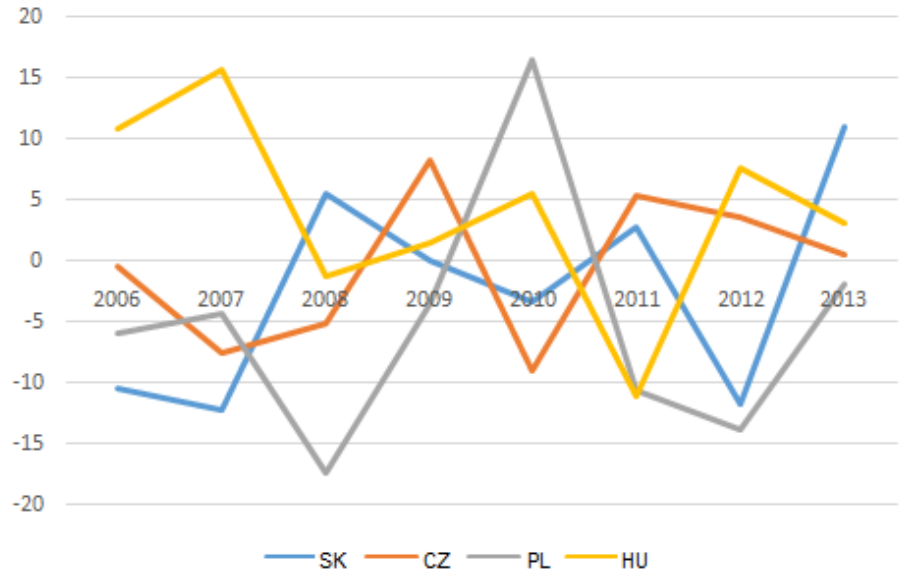
The highest total administrative costs are, with the exception of 2005, in Hungary ($\bar{x}$ = 38.37%) while being by an average of 51% higher than the total administrative costs in Poland. Hungary is also the country with the highest margin of variation (R = 0.124). The share of total administrative costs in Slovakia and the Czech Republic is similar.



Source: Own processing

Figure 5 – Comparison of administrative costs in the V4 countries, 2005-2013

Hungary is the only country within V4 where total administrative costs have risen during the nine years by 41.47%. In Czech, the total administrative costs stay constant ($\Delta\bar{x}$ = 0.21%) and in Poland are falling by an average of almost 4%. In any country, cannot be observed in the years 2005 - 2013 constant trend of falling or rising total administrative costs, as documented in Figure 5, and the high value of the coefficient of variation (VK_HU =181.77%).



Source: Own processing according to OECD Study

Figure 6 – Annual percentage changes of administrative costs in the V4 countries, 2006-2013

Graphically identified difference shave also been demonstrated through a Kruskal-Wallis test, i.e. there are differences between countries in the level of total administrative costs (KW =30.036, p ≤0.001).

Human resource management costs

Most HRM costs is spent in Poland ($\bar{x}$ = 73.71%) followed by Czech Republic with a distance of 2.7%. The lowest average wages are in Slovakia. Poland is also the country with the lowest HRM costs variability within V4 countries (V_K = 7.12%).

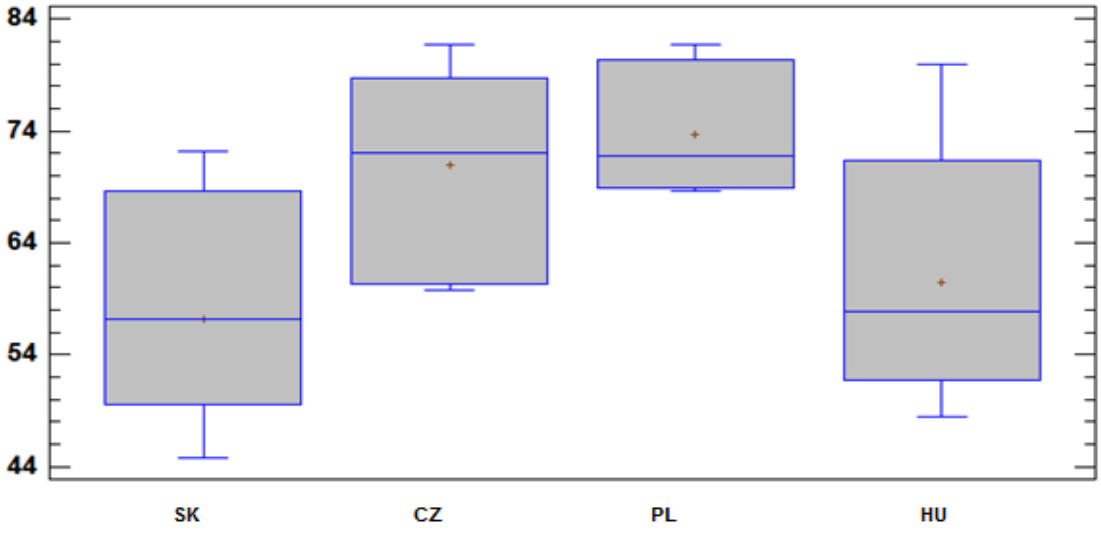


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Figure 7 – Comparison of HRM costs in the V4 countries, 2008-2013

In Slovakia, we can observe own ward trend of HRM costs ($\Delta\bar{x}$ = -3.12%), but this is mainly caused by significant change in 2012. In all countries, can be seen significant annual variations, *i.e.* instability of human capital (Figure 8).

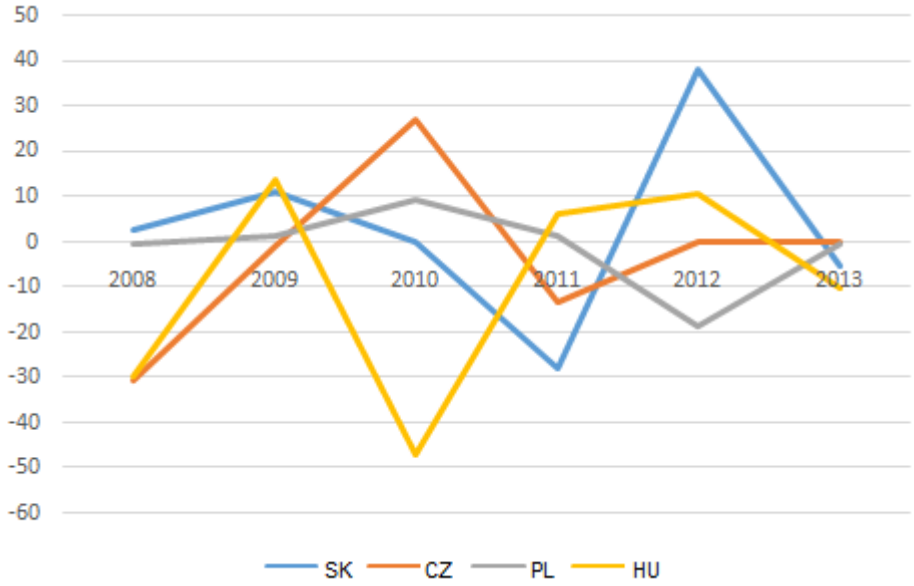

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Figure 8 – The annual changes in HRM costs in the V4 countries, 2008-2013

Levene test showed homoscedastic HRM costs in individual countries (LE=1.124; p=0.359). Test good match proved their normal distribution. ANOVA subsequently confirmed the graphic differences between labor costs.

Table 3 – ANOVA - the difference in HRM costs of V4

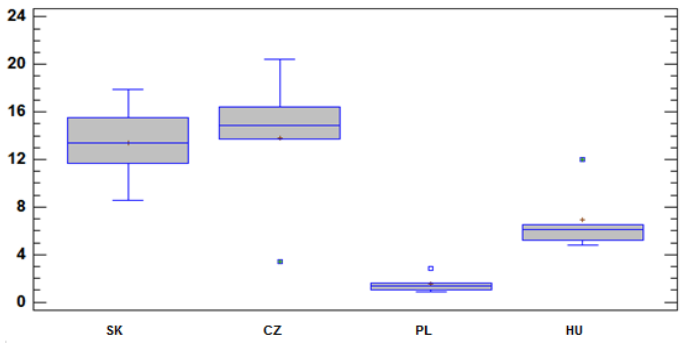
Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Between groups	1334.99	3	444.9970	5.38	0.0056
Within groups	1985.22	24	82.7173		
TOTAL (Corr.)	3320.21	27			

Source: Own calculations

By the above analyzes we can state the differences among the V4 countries in the relative volume of HRM costs.

Information technology costs

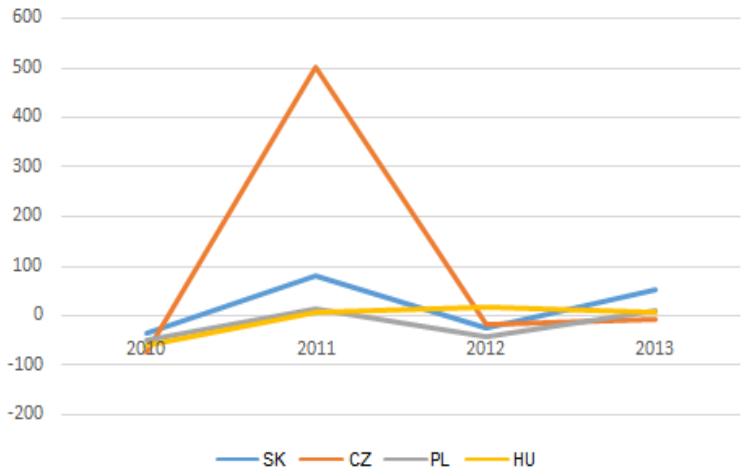
Significantly least IT costs is spent in Poland (Figure 9), which is also due to outliers (in 2009) the country with the highest rate variability in IT costs (V_K = 49.36%). IT costs in Slovakia and the Czech Republic are aligned ($\Delta\bar{x}$ = 0.34)



Source: Own processing

Figure 9 – Comparison of the cost of IT in the V4 countries, 2009-2013

Significant annual variations of similar character we can observe in all V4 countries. Following a significant slump in 2010 (such as ΔSR=35.8%) there was even more significant increase in IT costs in Slovakia and Hungary.



Source: Own processing according to OECD Study

Figure 10 – Annual percentage changes in IT costs in the V4 countries, 2008-2013

Differences between IT costs were also confirmed by Kruskal-Wallis test (KW =13:50; p=0.003), *i.e.* between the IT costs of V4 there are statistically significant differences. The cause of reject the null hypothesis was Polish IT costs, as is already illustrated by the Figure 10.

Conclusion

Tax administrative costs are all costs of state administration for organizing the tax system, for the registration of taxpayers, tax collection and control. We hypothesized that there are differences among the V4 countries in the amount of total administrative costs, HRM costs and IT costs expended by the tax authorities. Based on the analysis we can state the differences in the three groups of costs (total administrative, HRM, IT) among the V4 countries. In each of these groups, there was significantly different another country and therefore we consider the administrative cost structure in observed group of countries as variant.

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Ensuring of Sustainable Socio-Economic Development of the Region on the Basis of Capitalization and Economic Security

Julia V. LYSHCHIKOVA
Belgorod National Research University, Belgorod, Russia
lyshchikova@bsu.edu.ru

Anna V. ORLOVA
Belgorod National Research University, Belgorod, Russia
orlova_a@bsu.edu.ru

Yevgenia V. NIKULINA
Belgorod National Research University, Belgorod, Russia
nikulina@bsu.edu.ru

Abstract

The article presents the conceptual and categorical apparatus of sustainable socio-economic development of the region in the author's extended systematization, specifying the categories "criteria of economic security of the region", "threat to the economic security of the region", "indicators of capitalization of the regional economy", "reserves of capitalization of the regional economy". The authors developed a conceptual integrated multi-element system of sustainable socio-economic development of the region, reflecting the functional relationship and interdependence of sustainable development, capitalization and economic security of the region, their quantitative and qualitative characteristics.

Keywords: sustainable socio-economic development, regional development, economic security, regional economy capitalization, conceptual multi-element system.

JEL Classification: O44, Q01, R11.

1. Introduction

The concept of "sustainable development" is the last on emergence time global socioeconomic paradigm of development. Within its framework in the course of economic growth the needs of today's generation are met without creation of threats for opportunities of future generations to meet their own needs. This concept has replaced the concept of "development without distinctions", carried out by the United Nations Environment Program (UNCED) in 70-ies XX century, and "eco development" concept, which was adopted in the 80s of the last century. It is the result of scientific and socio-ideological thinking of a systemic crisis of civilization in the era of uncertainty and catastrophic escalation processes and global threats.

The institutionalization of the category "sustainable development" took place in 1992 at the UN Conference on Environment and Development in Rio de Janeiro (UNCED). After that, the idea of sustainable development as a global trend became the basis of the anti-crisis environmental modeling of economic activities at different levels and a full-fledged direction of domestic policies of a number of developed and developing countries. More than 100 states, including Russia, have developed their own strategies for sustainable development. In this case, the center of gravity moves to the sustainable development of the regional economy, because the stable regional blocs form a stable national economy.

In the light of decisions of the global Summit of the sustainable development "Rio+20" issues of creating sustainable regional economic development models are highly relevant. These models have to lean on local resources, the balanced interaction of the nature and economy in spatial systems, further capitalization of resources at all system levels (national, regional and local), creation of system of distribution of the income, fair from the ecological and social points of view, innovative and technological updating of productions, an effective institutionalization of the natural and resource relations.

The relevance of the study of conditions and factors of sustainable development of Russian regions is now growing under the influence of the growing manifestations of the geopolitical and economic instability in the world economy. It determines the need to ensure the economic security and to increase the capitalization of the Russian regions. In the complex, it is a necessary prerequisite for achieving sustainable socio-economic development of each region individually, and the national economy as a whole.

2. Theoretical and methodological bases of the research

2.1. Theoretical basis of the research

The research objective is the development of theoretical provisions of sustainable social and economic development of regions in the conditions of global instability on the basis of criteria of capitalization and economic security.

The hypothesis of the research consists in need of inclusion in the system of sustainable social and economic development of the region the categories of capitalization and economic security of the region, establishment of functional interrelations and interdependence of their quantitative and qualitative characteristics for the purpose of definition of alternative scenarios and forming of optimum strategy of development of regional economy in the conditions of risk, uncertainty and incompleteness of information.

2.2. Methods of the research

Dialectical, categorical, subject-object, retrospective and monographic techniques have allowed to clarify and supplement the conceptual and categorical apparatus of research, in particular, to determine at the sub-national level, the concept of “criteria for the economic security of the region”, “threat to the economic security of the region”, “indicators of capitalization of the regional economy”, “reserves of capitalization of the regional economy”.

Using system-elemental and structural-functional analysis has allowed revealing the elements of sustainable socio-economic development of the region and creating a system of sustainable socio-economic development of the region. This system reflects functional interrelations and interdependence of a sustainable development, capitalization and economic security of the region, their quantitative and qualitative characteristics.

2.3. Theoretical and practical significance of the research

The theoretical significance of the study lies in the author's extended systematization of conceptual and categorical apparatus of sustainable socio-economic development of the region and the construction of a comprehensive conceptual framework for sustainable socio-economic development on the basis of the inclusion in the system the categories “capitalization of a region” and “economic security of the region” and their characteristics.

The practical significance of the research results is presented by opportunities to develop methodological tools of economic and mathematical modeling of the indicative assessment of sustainable socio-economic development of regions, using the criteria of economic security and capitalization. It will allow revealing threats and reserves of growth of regional economy, to define alternative scenarios of development and to form optimum strategies of functioning of regional systems in the conditions of global geopolitical and economic instability.

3. Results and discussion

3.1. Genesis, evolution and criticism of the concept of a sustainable development

Until nowadays generally accepted definition of sustainable development does not exist, in spite of the continuous expansion of the scope of its use. In the scientific literature Boyer (2000), Bolshakov and Shamaeva (2013), Colgan (1997), Costanza and Folke (1994), Durdiyeva *et al.* (2015), Hecht (1999), Kim (2004), Kuklina (2014), Mingalyov and Gershanok (2012), Mironenko and Kolchugina (2012), Rasoolimanesh *et al.* (2011), Wheeler 2002), Xu *et al.* (2002), Yusupov 2012) there are more than 60 different definitions that emphasize certain aspects. In general, the term suggests trinity of social, economic and environmental component.

The term sustainable development originally appeared in environmental management. According to one data, in relation to regulation of fishery in Canada in the middle of the XX century in the system of operation of fish resources. According to others, even 100 years before Canadian fishermen the same idea, but with reference to the system of forest exploitation nominated German foresters. At the same time in both cases operation of a resource can continue beyond all bounds long if foreign factors don't interfere.

Often complex economic content of sustainable development is defined as sustained economic growth, accompanied by an increase in quality of life and the expansion of civil liberties. According to this statement, sustainable development includes any type of growth. While the category of "development" is broader than the category of "growth", as economic growth in its modern sense has physical limits due to limited resources. The development is basically unlimited, as it implies a qualitative improvement of the society on the basis of scientific and technical progress.

The concept of a sustainable development which has become world-wide popular and is reflected in many documents of the international, national and regional level isn't dogma and constantly is exposed to different criticism (Boyer 2000, Colgan 1997, Durdiyeva *et al*. 1999, Kuklina 2014, Mironenko and Kolchugina 2012, Wheeler 2002, Xu *et al.* 2002, Yusupov 2012). It is possible to allocate several objective aspects of criticism of the concept of a sustainable development, as follows:

- Incorrectness of the term "sustainable development", the logical contradiction which is contained *in it*. There is an opinion that words sustainable and development contradict each other and development can't be sustainable and it is necessary to refuse either development, or sustainability. However, development is a special case of the movement, and stability of the movement – one of the most important concepts of mathematics, and, therefore, and in stability of development there is nothing contradictory.
- The narrowness of the term, the trend of development issues to the attention of the environmental aspect. It doesn't correspond to recommendations of the world community and contradicts the principle of systematic scientific thinking. At allocation of the problems facing the world community there can't be rating preferences as it is necessary to solve these problems in a complex.
- Lack of the uniform concept of a sustainable development that generates considerable difficulties in realization. The variety of concepts of a sustainable development is connected with distinctions in vision of ratios between political, economic, ecological and social development and in understanding of global prospects in general.
- Selectivity of the concept of a sustainable development. There is a point of view according to which the implementation of the concept of a sustainable development will bring the benefit not to all mankind, but only to its certain part. There is a danger of formation of process of further absorption of resources to functioning of global reproduction links. The world income is formed and redistributed there between the developed countries and regions to the detriment of other countries and regions with their raw material, human, intellectual and financial resources.
- The controversy of a number of methods, which the concept of sustainable development uses. For example, the extrapolation modeling applied within the concept of a sustainable development does not always give an objective result. It is necessary to consider that the forecasts made on its basis come true at stable policy in the field of consumption of the resources. At introduction of the amendments connected with action of scientific and technical progress the law of the decreasing efficiency of factors of production ceases to work, and production capabilities extend to the infinite horizon.
- Disputable in the understanding of sustainable development, which arises due to the asymmetry of social and economic development, cultural and political division of peoples, countries, regions.
- One of the most important aspects of the critique of the concept of sustainable development is the lack of systemic mechanisms of its implementation, institutional and financial.

Orientation to a sustainable development is traced at all levels of management now – from corporate to national and global. The large direction of researches within a problem of providing a sustainable development is made by the works devoted to the analysis of a sustainable development of the region through a prism of interrelations “economic security → sustainable development” and “capitalization → sustainable development” (Altynbayeva 2012; Antonova *et al*. 2015, Gak and Loginova 2011, Gavkalova and Barka Zine 2012, Kokhanovskaya and Bashirova 2014, Krivorotov *et al*. 2014, Kuklina 2015, Malyutin 2014, Mishchenko and Yutyaeva 2012, Molchan and Anufriyeva 2015, Rozhkov 2014, Silifonkina 2013, Volkov 2015).

In many works of this direction the specified interrelations are considered not as fundamental elements of a sustainable development, but as the certain “characteristics”, “conditions”, “criteria”, “indicators” etc. It gives the grounds to consider interrelations and interdependence of the categories “sustainable development”, “capitalization” and “economic security” at the level of the region in more detail.

3.2. The interrelation of the categories “capitalization” and “sustainable development” at the regional level

The issues of sustainable development of the regions and the capitalization of their resource potential in order to improve the quality and standard of living are fully represented in the scientific literature and developed in theoretical and methodological aspect (Altynbayeva 2012, Antonova *et al.* 2015, Gavkalova and Barka Zine 2012, Molchan 2011, Rozhkov 2014, Silifonkina 2013). However, the problem of interaction of processes of capitalization and a sustainable development at the level of the region remains insufficiently studied.

In the 1970th D. Hartwick has formulated a condition of a sustainable development of society. In his opinion, the sustainable development can be provided by investment of all rent from operation of natural resources, in the reproduced capital, education and environmental protection (Hartwick 1977). On the basis of Hartwick's rule two approaches to a sustainability assessment were created: weak and strong. Weak sustainability is the preservation of the value of the total capital, including material, human and natural capital. A weak concept of sustainability suggests that different types of capital can be interchangeable. Strong sustainability suggests that each type of capital should be kept below a certain minimum level.

The formulation of the World Bank (2015) in relation to the concept of sustainable development states: "Management of a sustainable development is a management of all capital of society for the purpose of achievement of interests of preservation and enhancement of human opportunities". The difficulty lies in determining the nature of mutual interdependence of capitalization processes and sustainable socio-economic development of regions. In addition, a particular problem is the allocation of key resources of regional capacity and determination of theoretical approaches to this release.

Therefore, one of the objectives of this study is theoretical substantiation of essence and directions of activation of the capitalization of the resource potential of the region in the aspect of its sustainable socio-economic development.

Sustainable development of the region means constancy or increase over time of the value of the regional capital assets. At the same time the main source of a sustainable development in the conditions of globalization is not only the natural and material (physical) capital, but also the growing financial and intellectual capital of the region. The sustainable development of the region means the process of changes in use of resources and a certain orientation of capital investments in total exceed the value of the available and predicted capacity of the region. Such approach allows allocating capitalization as the main characteristic of a sustainable development of the region. The sustainable development of regional economy assumes preservation for a long time of efficiency of use of resources which universal expression is the capital. The indicator of capitalization reflects prospects of effective use of resources and, respectively, sustainable economic development. Therefore, an economic source of providing a sustainable development is the growing capitalization of resources of regional economy.

3.3. The interrelation of the categories «economic security» and «sustainable development» at the level of the region

Further we will focus on the analysis of interrelation "economic security → a sustainable development", which is also the object of many researches (Gak and Loginova 2011, Kokhanovskaya and Bashirova 2014, Krivorotov *et al.* 2014, Kuklina 2015, Malyutin 2014, Mishchenko and Yutyaeva 2012, Molchan and Anufriyeva 2015, Volkov 2015). In our opinion, underestimation of the importance of a role and the place of a factor of economic security is one of serious theoretical problems in studying of complex system of providing a sustainable development of the region.

The concepts of security and sustainable development are close, but aren't identical. The security understood in the broadest sense is one of sustainable development goals and a necessary condition of its realization. Realization of security within ideology of a sustainable development is most fruitful. Thus, sustainable development is not only a systemic unity of economic, social and other activities, but also immanent relationship of development and security: the provision of security through development and of development through security.

This position is shared by the former UN General Secretary Kofi Annan: "The fair and sustainable development is one of necessary conditions of security, however, providing the minimum standards of security, in turn, is one of prerequisites of development. The aspiration to solve one problem in a separation from another doesn't make big sense" (The future we want. Outcome of the Conference Rio+20; 2012).

It is necessary to state existence of close dependence between these concepts, and also complexity of their correlation from the point of view of inclusion of one in another and hierarchy. In this research we use such characteristic of this interrelation as economic security as the purpose, the prerequisite and a necessary condition of a sustainable development of the region. Such conclusion objectively follows from the analysis of results of social and economic development of world economy of the last years when different crises have broken stability of functioning of economies of many countries and regions and have provoked destabilization of all world economic system.

3.4. Conceptual system of sustainable socio-economic development of the region on the basis of capitalization and economic security

Based on the foregoing, sustainable socio-economic development of the region can be represented by the implementation of the capitalization process of the resource potential in the regional economic space in the conditions of a sufficient level of economic security (Figure 1).

The capitalization of the region can be defined as multidimensional process of expanded reproduction of the regional capital and transformation of its forms by involvement of resources of the region into economic circulation. The indicator of development of process of capitalization of regional economy is the growth of value of capital assets of regional economic subjects (households, the enterprises, and the region in general) at the expense of a regular gain of a gross regional product. At the same time, it is important to define reserves of capitalization of regional economy, *i.e.* potential opportunities of growth of value of regional assets due to their more effective use or involvement in economic circulation of earlier unexploited resources.

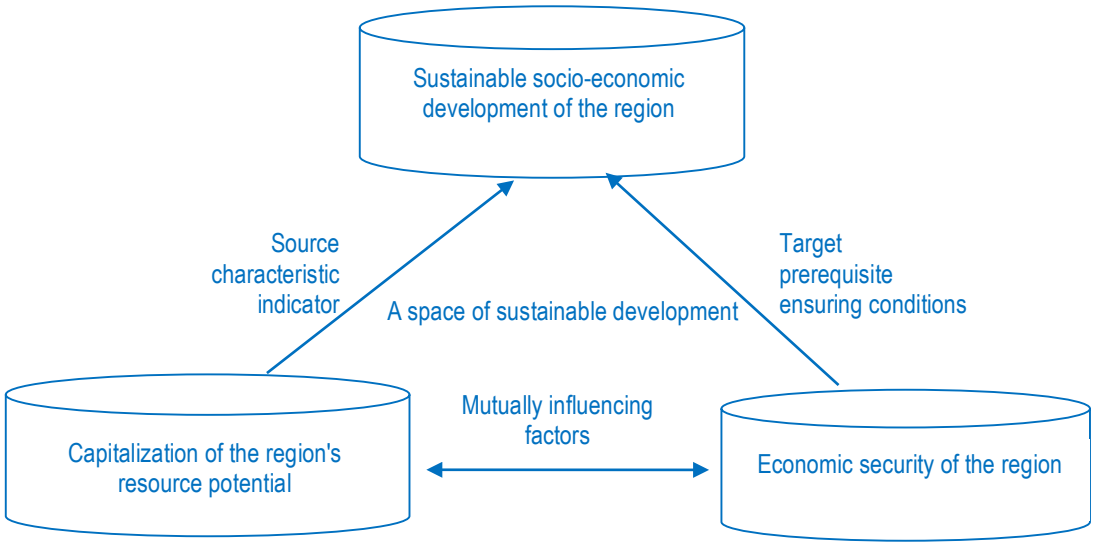

Figure 1 - A system of interrelations of sustainable development, capitalization and economic security of the region ("a sustainability triangle")

The analysis of the existing definitions of economic security of the region has allowed allocating three approaches to the essence of this concept (Table 1).

Table 1 - Systematization of the approaches to definition of the concept “economic security of the region”

№	The approach	The essence of the approach	Representatives
1.	Protection of interests	The status of the regional economy, which provide guaranteed protection of regional interests, even under adverse conditions of the development of internal and external processes	Bludova and Cherevko 2014, Ganin and Ganin 2015
2.	Stability maintenance	Maintenance of the regional economy, characterized by resistance to internal and external factors that violate the functioning of social production and undermining the current level of life	Chepelenko 2014, Kazantsev 2012, Soynikov 2015, Volkov 2015
3.	Safeguarding of independence	The set of conditions and factors ensuring the independence of the regional economy, its stability and the ability for constant renewal and self-improvement	Feofilova 2010, Feofilova and Litvinenko 2014, Yeghiazaryan 2014

On the basis of the synthesis of these approaches, taking into account the foregoing theoretical assumptions we can determine the economic security of the region as the ability and willingness of the regional economic system to create, provide and maintain the prerequisites and conditions for sustainable economic development under the influence of internal and external negative factors. The negative conditions and dangerous

factors for realization of economic interests of regional subjects and, therefore, for a sustainable development of the region, act as threats of economic security of the region.

The main objects of the economic security of the region are the personality; economic entities of commercial and noncommercial character; the state represented by various institutes at the regional level. The subjects of economic security of the region are: the state represented by bodies of the legislative, executive and judicial authorities with their institutes at the regional level; commercial and noncommercial legal entities; citizens. In other words, the main objects of economic security of the region depending on concrete circumstances can act as subjects of economic security and vice versa.

Economic security of the region is estimated by the criteria characterizing the qualitative aspect of the ability of regional economic system to resist to negative impact of internal and external threats. Due to the separate criteria, the indicators of economic security defining the quantitative characteristic of this phenomenon are formed. Threshold values of indicators, *i.e.* extreme sizes which non-compliance interferes a sustainable development and leads to formation of negative tendencies in system of economic security are of great importance. The highest level of economic security is reached when all complex of indicators is in limits of the threshold values, and threshold value of one indicator is not reached to the detriment of others.

Thus, the multi-element structure of the system of sustainable social and economic development of the region on the basis of capitalization and economic security can be presented as follows (Figure 2).

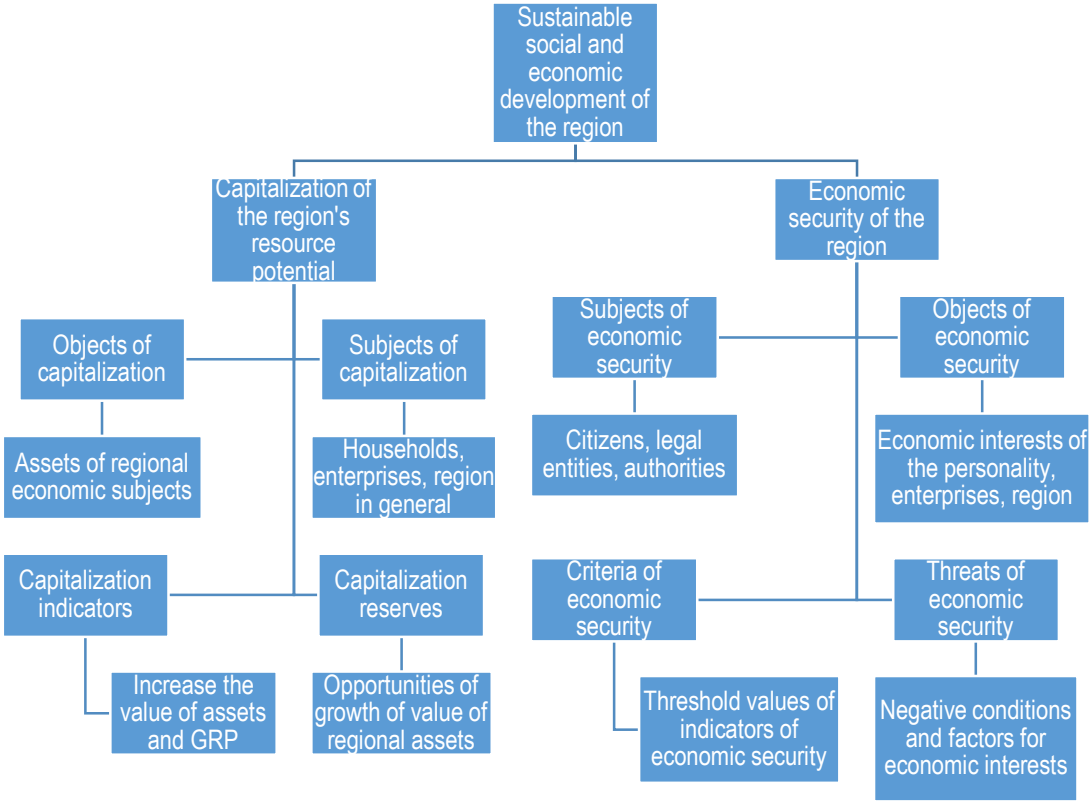

Figure 2 - Structural decomposition of system of sustainable social and economic development of the region

Conclusion

The transition to sustainable regional development requires strengthening of the integration process, the output of economic relations in the region as outside their geographical boundaries, as beyond Russia. Regions need embedding in world reproduction cycles on the basis of fair exchanges in the world markets, expansion of opportunities of access to world resources of development, system integration into the world economy for the purpose of ensuring growth of capitalization and sufficient level of economic security for realization of strategic interests of achievement of a sustainable development.

In our opinion, sustainable economic growth of regional economy as a basis of its sustainable development has to be characterized by the balanced use of the natural, human, financial and physical capital with the state

support of environmental protection and equitable distribution of opportunities for growth of quality of life of the population. In contrast to this approach in many regions of Russia takes place or unstable growth with sharp changes of economic dynamics and a standard of living of the population now, or the distorted growth with primary development and use of the industrial physical capital to the detriment of reproduction of the human and natural capital.

In modern Russia factors of sustainable development begin to develop in a few the most developed regions. Therefore, sustainable development for all remains an elusive goal in the conditions of extremely low market capitalization of the assets and the lack of a system of criteria for the economic security of the region, as well as the prerequisites for the implementation of sustainable development strategies in the form of integrated inter-regional economic relations.

The analysis of the relationship of capitalization, economic security and sustainable development of the regional economy shows the existence of certain relationships between the development of the process of capitalization of the region's resource potential, economic security level of the regional economic system and its sustainable development. In the future, it seems necessary to develop a model of sustainable socio-economic development of the region based on the capitalization criteria and economic security. Analytical and experimental validation of this model will allow using the capitalization as the target category and economic security as a limiting prerequisite in the design of regional strategies for the sustainable socio-economic development.

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The Impact of Macroeconomic Fundamentals on the Indonesian Sharia Stock Index

Tasnima NUR AZIZAH
Faculty of Economics and Business-Brawijaya University, INDONESIA
taznurazizah@gmail.com

Dias SATRIA
Faculty of Economics and Business-Brawijaya University, INDONESIA
dias.satria@gmail.com

Setyo TRI WAHYUDI[7]
Faculty of Economics and Business-Brawijaya University, INDONESIA
setyo81@gmail.com

Abstract:

Stock market index is a tool used by the investors to determine the market and compare to return on some certain investments. Many studies have been conducted aimed at investigating the relationship between stock market index and macroeconomic fundamentals. However, only a few studies investigated the Sharia stock index. This study investigated the long-term and short-term relationship between Indonesian Sharia Stock Index (ISSI) as the dependent variable and macroeconomic fundamentals as the independent variables comprising Consumer Price Index (CPI) - the proxy for inflation rate, interest rate, exchange rate, and money supply. The method used to investigate the long-term and short-term relationship was Vector Error Correction Model (VECM). Before using VECM, Johansen's Co-integration Test was used to test the co-integration relationship between the dependent and independent variables. The result of showed that there is a long-term relationship, but no short-term relationship between those variables was found. The result of both tests revealed significant relationship between dependent variable and independent variables. However, the variable of CPI was insignificant in influencing ISSI. The conclusion is that ISSI reacts positively towards interest rate and money supply while high depreciation of Rupiah will potentially create difficulty towards the market conditions in a long-term.

Keywords: Sharia stock index, vector error correction model.

JEL Classification: G11, C13.

1. State of Art

Stock market index is the average for price of selected stocks commonly used by the investors as for determining the market and comparing the return on certain investments. Macroeconomic fundamental is one factor among many factors used to predict a lower or higher return on investments. The stock price return can possibly and significantly be affected by the change of the macroeconomic fundamentals. Studies on the influence of macroeconomic fundamentals on the stock market index commonly employed various methods and macroeconomic fundamentals (Naik 2013, Tripathy 2011, Hosseini *et al*. 2011, Yadav 2012). However, only a few studies studies dealt with the influence of macroeconomic fundamentals on Sharia stock market index, especially in Indonesia.

Indonesia is a developing country that has many different kinds of bank. Banking in Indonesia does not only consist of commercial banks, but also many Sharia banks and other types of banks. As a unique type of bank, Sharia bank is slightly different from the common commercial bank, but it tends to apply the Islamic principles as the basic principles in operating the banking system. According to OJK (*Otoritas Jasa Keuangan* or Financial Services Authority of Indonesia), an institution responsible for monitoring all banks in Indonesia, the principles of Islamic banking operation comprise mutual benefits principle and partnership providing an alternative system of banking with mutual benefits for the bank and the customers. OJK states that in the context of macro-economic management, an extensive use of various Islamic financial products and instrument helps attaching financial sector and real sector and creates the harmonization between the two sectors and in addition to support financial and business, the wide use of Islamic product and instrument will also reduce speculative transactions so that the economy supports the stability of overall financial system. At the end, the Islamic banking will significantly contribute to the achievement of mid-long term price stability. Therefore, this study concerns the influence of macroeconomic fundamentals on the Sharia stock market index as Sharia banking system also plays an important

[7] Corresponding author

role in the economy of Indonesia. Further, this study is aimed at analyzing the relationship between macroeconomic fundamentals and Sharia stock market index.

2. Methods and materials

This study is aimed at analyzing the relationship between macroeconomic fundamentals and Sharia stock market index. The variables used for the present study are Consumer Price Index (CPI) - the proxy for inflation rate–interest rate, exchange rate, and money supply. The method used to test the long-term relationship between the independent variable and dependent variable was co-integration test by Johansen (1991). However, before testing the long-term relationship using co-integration test, first the non-stationary of the variable of time series data needs to be tested by using unit root test method. Next, after testing the long-term relationship, the residual diagnostics methods, which include serial correlation LM test and Granger causality test, were used to test the error term on the residuals.

The test procedures used in this study were (i) The Unit Root Test, (ii) Granger Causality Test, (iii) Johansen's co-integration, and (iv) Vector Autoregression (VAR) and/Vector Error Corection Model (VECM). Unit root test is a test to make sure whether a variable of time series data is non-stationary. Non-activity of variable is a precondition for co-integration and all the series must be integrated of the same order (Barbić *et al.*, 2011). The next test conducted were residual diagnostics. The purpose is to check the error term on the residuals. Residuals from a regression should never contain any systematic information, since this is a sign that this information is not included in the regression model (Talla 2013). Then, the second test conducted was Granger causality test. It was aimed to determine whether one variable is able to forecast another variable. The Granger type causality procedure was applied to determine the direction of causation among the variables (Tripathy 2011).

The next test used was Johansen's co-integration test, because Johansen's co-integration approach tends to be regarded as full information maximum likelihood approach that allows for testing co-integration using system of equations as a whole. The result of Johansen's Co-integration test defines the next method to do between VECM and VAR. If the result of Johansen's Co-integration test shows that there is a co-integrated relationship between the independent variables and the dependent variable, then the next method is VECM. However, if the result does not show any co-integrated relationship, the next method to use has to be VAR. According to Naik (2013), when the co-integrated relationship exists between independent variables and dependent variable, to use Johansen's method, the equation above needs to be turned into VECM which Error Correction Model (ECM) is basically a useful approach to estimate both long-term and short-term effects of one time series on other time series.

3. Findings

The descriptive statistics for all the variables included in this study, namely, ISSI (Indonesian Sharia Stock Index) as the dependent variable, CPI (Consumer Price Index), interest rate, exchange rate, and money supply as the independent variables are presented in Table 1. The value of standard deviation indicates that money supply and exchange rate are relatively more volatile compared to Indonesian Sharia Stock Index, consumer price index, and interest rate.

Table 1 - Descriptive statistics

Descriptive Statistics	Y	X1	X2	X3	X4
Mean	148.393	127.50	6.76	10,803.9	3,498,619.0
Minimum	115.420	110.99	5.75	8,532.0	2,475,286.0
Maximum	174.317	146.84	7.75	14,396.1	4,508,600.0
Std. Deviation	16.023	10.86	0.80	1,674.1	581,961.6
N	54				

Source: data processed, 2016

Table 1 shows the monthly descriptive statistics of all the variables from May 2011 until October 2015 with fifty-four of the total data of each variable. The mean describes the average value in the series and Std. Deviation measures the dispersion or spread of the series while the maximum and minimum statistics measures upper and lower bounds of the variables under study during the chosen time span (Talla 2013). The average value of Indonesian Sharia Stock Index is 148.393 which is not really far from the minimum and the maximum value of the Indonesian Sharia Stock Index. The similar case happened to the other variables, including consumer price index,

interest rate, exchange rate, and money supply. Therefore, all those data are assumed not to be out of the critical point.

Result of Unit Root Test

The first method used in this study was Augmented Dickey-Fuller (ADF) unit root test to test whether all of the variables, namely Indonesian Sharia Stock Index as the dependent variable, consumer price index, interest rate, exchange rate, and money supply as the independent variables, are stationary or non-stationary. In order to continue to the next method, all those variables should be stationary.

Table 2 - ADF unit root test results at level, trend and intercept

Null hypothesis	P-Value	Null Hypothesis	Results
Y (ISSI) is not stationary	0.9060	Do not reject	ISSI is non-stationary
X1 (CPI) is not stationary	0.5364	Do not reject	CPI is non-stationary
X2 (IR) is not stationary	0.3735	Do not reject	IR is non-stationary
X3 (ER) is not stationary	0.3433	Do not reject	ER is non-stationary
X4 (MS) is not stationary	0.0055*	Reject	MS is stationary

Note: (*) significant at 5% critical level
Source: data processed, 2016

Based on the Table 2, only variable of Money Supply (MS) that can reject the Null hypothesis at level, because the p-value of this variable, 0.0055, is lower than 5% which means that the variable is stationary. While, the four variables, namely Indonesian Sharia Stock Index, consumer price index, interest rate, and exchange rate, cannot reject the Null hypothesis, because the p-values of all those variables are higher than 5%. It means that all those variables are non-stationary at level. Since not all of the variables can reject the Null hypothesis, The Unit Root Test at 1st difference is conducted.

Table 3 - ADF unit root test results at 1st difference, trend and intercept

Null Hypothesis	P-Value	Null Hypothesis	Results
Y (ISSI) is not stationary	0.0000*	Reject	ISSI is stationary
X1 (CPI) is not stationary	0.0000*	Reject	CPI is stationary
X2 (IR) is not stationary	0.0151*	Reject	IR is stationary
X3 (ER) is not stationary	0.0003*	Reject	ER is stationary

Note: (*) significant at 5% critical level
Source: data processed, 2016

Table 3 shows the test results of ADF unit root test at 1st difference that include trend and intercept in test equation. Since the Money Supply is stationary in level then excluded from the 1st difference test. Based on the Table 3, all of the four variables can reject the Null hypothesis, because the p-values of all the variables were lower than the critical value. Therefore, all of the five variables, namely Indonesian Sharia Stock Index, consumer price index, interest rate, exchange rate, and money supply, were stationary at 1st difference of ADF unit root test.

Result of Granger causality

The second method that used in this study was Granger causality to determine whether one variable is able to forecast another variable and vice versa. When there is only one variable that is able to forecast the other variables and not the other way around, it is called as an unindirectional relationship between those two variables. However, when the two variables are able to forecast each other, it is called as indirectional relationship. Table 4 shows the test results of Granger causality in order to determine whether a certain variable has the ability to forecast another variable or not. The Null hypothesis is rejected when the p-value is lower than the critical value (5%). As shown by Table 4, variable X1 and X2 have unindirectional relationship. The value of 0.0013 which lower than 5% can be concluded that X2 Granger causes X1. It means that the variable of X2 (interest rate) assists in predicting the value of X1 (CPI). However, X1 does not assist in predicting the value of X2, because the p-value was higher than 5%. Another unindirectional relationship is between X1 (CPI) and X4 (Money Supply) which CPI is the one that assists in predicting the other variable, money supply. Interest rate and money supply also assist in predicting Exchange rate (X3) while Y (ISSI) assists in predicting both interest rate and exchange rate. The variables that do not have a Granger causality relationship are consumer price index (X1) and exchange rate (X3),

Indonesian Sharia Stock Index (Y) and consumer price index (X1), interest rate (X2) and the money supply (X4), and the Indonesian Sharia Stock Index (Y) and the money supply (X4).

Table 4 - Granger causality test result

Null Hypothesis:	Obs.	F-Statistic	Prob.
X2 does not Granger Cause X1	52	7.65405	0.0013
X1 does not Granger Cause X2		0.06948	0.9330
X3 does not Granger Cause X1	52	2.26365	0.1152
X1 does not Granger Cause X3		3.09185	0.0548
X4 does not Granger Cause X1	52	2.80637	0.0706
X1 does not Granger Cause X4		3.63716	0.0340
Y does not Granger Cause X1	52	0.03705	0.9637
X1 does not Granger Cause Y		0.69939	0.5020
X3 does not Granger Cause X2	52	1.71217	0.1915
X2 does not Granger Cause X3		3.38301	0.0424
X4 does not Granger Cause X2	52	2.16418	0.1262
X2 does not Granger Cause X4		0.20974	0.8115
Y does not Granger Cause X2	52	6.19831	0.0041
X2 does not Granger Cause Y		0.17207	0.8425
X4 does not Granger Cause X3	52	3.41082	0.0414
X3 does not Granger Cause X4		0.52183	0.5968
Y does not Granger Cause X3	52	6.58025	0.0030
X3 does not Granger Cause Y		0.21151	0.8101
Y does not Granger Cause X4	52	2.72098	0.0762
X4 does not Granger Cause Y		0.30300	0.7400

Source: data processed, 2016

Result of Johansen's Co-integration Test

The purpose of Johansen's Co-integration Test is to test whether the equation has a co-integrated equation or not. The first test before testing using Johansen's Co-integration test, determining the lag for Johansen's Co-integration test and Vector Error Correction Model (VECM) is needed. Table 5 shows the test results of lag length criteria test to determine the lag for Johansen's Co-integration test and VECM test. There are five criteria in this test namely LR test statistic, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), and Hannan-Quinn Information Criterion (HQ). The most lag order selected by the criteria will be the lag used for Johansen's Co-integration test and VECM test method. Based on the Table 5, the most lag order selected by the criterion is lag 2. Therefore, the lag used for Johansen's Co-integration test and VECM test in this study was 2.

Table 5 - The Test Result of Lag Length criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1474.039	NA	3.40e+19	59.16157	59.35277	59.23438
1	-1183.574	511.2196	8.36e+14	48.54294	49.69016*	48.97981*
2	-1156.955	41.52580*	8.08e+14*	48.47818*	50.58141	49.27910
3	-1137.092	27.01257	1.07e+15	48.68369	51.74293	49.84867
4	-1116.370	24.03740	1.50e+15	48.85482	52.87007	50.38385

Note: (*) indicates lag order selected by the criterion
Source: data processed, 2016

After determining the lag using lag length criteria method, we can move onto the next method, Johansen's Co-integration test. If the result shows that the independent variables have a long-term relationship with the dependent variable, we can use the Vector Error Correction model (VECM) to determine the short-term causal relationship running from the independent variables to the dependent variable. However, if the result shows that the independent variables do not have a long-term relationship with the dependent variable, the method used was Unrestricted Vector Auto-Regression (Unrestricted VAR) to determine the linear interdependencies among all of those variables.

Table 6 shows the test result of Johansen's Co-integration test method with the results of both trace statistic and Max-Eigen statistic that indicate the presence of a unique co-integrating vector at 5% level (Rasiah, 2010). In order to reject the Null hypothesis, the trace statistic and the Max-Eigen statistic should be higher than the critical value at 5%. If the Null hypothesis is rejected, then we conclude that these variables are co-integrated. Based on Table 6, the value of Trace statistic, 82.75457, is higher than 69.81889, and the critical value at 5% or the p-value of this statistic, 0.0033, is lower than 5%, the critical level. Therefore, the Trace statistic shows the presence of cointegration for this equation of variables. The empirical results suggest the presence of a long-term relationship between all of the independent variables and Indonesian Sharia Stock Index. After checking the first Null hypothesis in the Trace statistic, checking the second Null hypothesis was carried out. The second Null hypothesis in the number of co-integrated equation, at most 1, is that there is at least one co-integrated equation. We can reject the Null hypothesis when the p-value is lower than 5%. However, in the test result shown in Table 6, the p-value is 0.2251 which is greater than 0.05, the critical level. Therefore, we cannot reject the Null hypothesis which means that there is at most one co-integrated equation or, in other words, there is co-integration among all of the five variables.

Table 6 - Johansen's Co-integration Test Result

Hypothesized	Trace	Critical Value	Prob.	Max-Eigen	Critical Value	Prob.
No. of CE(s)	Statistic	α = 5%		Statistic	α = 5%	
None*	82.7545	69.81889	0.003	37.34908	33.87687	0.0185
At most 1	45.4055	47.85613	0.835	21.90812	27.58434	0.2251
At most 2	23.4973	29.79707	0.222	17.77579	21.13162	0.1385
At most 3	5.72158	15.49471	0.728	5.415418	14.26460	0.6887
At most 4	0.00598	3.841466	0.580	0.306170	3.841466	0.5800

Source: data processed, 2016

Note: (*) denotes rejection of the hypothesis at the 0.05 level

The second statistic to check is the Max-Eigen statistic. The value of Max-Eigen statistic, 37.34908, is also greater than the critical value at 5%, 33.87687. Therefore, the Max-Eigen statistic also shows the presence of cointegration for this equation of variables. Like the first empirical results of this method, the empirical results of the second statistic suggest the presence of a long-term relationship between all of the independent variables and Indonesian Sharia Stock Index. The Null hypothesis in the number of co-integrated equation at most 1 is the same with the Null hypothesis in the first statistic, that is at least one co-integrated equation. However, just like the result of the test statistic, we cannot reject the Null hypothesis, because the p-value at most 1 in Max-Eigen statistic, 0.2251, is higher than 0.05, the critical level. Therefore, we also cannot reject the Null hypothesis which means that there is at most one co-integrated equation or, in other words, there is co-integration among all of the five variables. Since both of Trace and Max-Eigen statistics show the same results for the Johansen's Co-integrating test, then we can conclude that all of the five variables in this study, namely Indonesian Sharis Stock Index, consumer price index, interest rate, exchange rate, and the money supply, are co-integrated or, in other words, have a long-term relationship.

Result of VECM

From the results of VECM method, there were five equations from all of the variables. D(Y) equation is an equation of the dependent variable, Y, as in the result of the VECM test. There are also D(X1), D(X2), D(X3), D(X4) determining the equation of the independent variables as in the result of the VECM test. However, in this study, the focus was not merely on the equation of D(Y) as the dependent variable to determine the short-term causality from the independent variables, but also on the dependent variable.

Table 7 - The Test Result of D(Y) Equation from the VECM Test Result

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.370961	0.177237	-2.093020	0.0429
C(2)	0.304160	0.195412	1.556509	0.1277
C(3)	0.091918	0.193662	0.474633	0.6377
C(4)	-0.458162	0.214809	-2.132884	0.0393
C(5)	-0.301179	0.218051	-1.381228	0.1751
C(6)	-11.12156	7.134003	-1.558951	0.1271
C(7)	2.968846	7.593623	0.390966	0.6980
C(8)	0.009357	0.007019	1.333172	0.1902
C(9)	0.000478	0.005558	0.085951	0.9319
C(10)	-4.77E-06	3.04E-05	-0.156739	0.8763
C(11)	-1.84E-05	2.91E-05	-0.634167	0.5297
C(12)	-0.115182	1.957051	-0.058855	0.9534

Source: data processed, 2016

Table 7 shows the test results of D(Y) equation from the VECM test results in order to obtain the p-value of each variables from the D(Y) equation. From the result in Table 7, we can see that the results were significant, because the p-value of C(1), which represents the error correction term, was 0.0429 which means that it is lower than 5%. C(1) was the adjustment speed towards long-term equilibrium. The coefficient of C(1) was negative, meaning that there is long-term causality running from the independent variables, such as consumer price index, interest rate, exchange rate, and money supply to the dependent variable, Indonesian Sharia Stock Index. Having a long-term causality from those independent variables means that they have influence on the Indonesian Sharia Stock Index in the long-term.

The next step of the test was checking whether each independent variable influence the dependent variable in short-term, or in other words, checking whether there was short-term causality from each independent variable to the dependent variable. In Table 7, C(2) and C(3) are the coefficient Y in the D(Y) equation. Therefore, C(2) and C(3) represent Y, but C(2) and C(3) were not used because the focus was on on the coefficient of the independent variables. C(4) and C(5) are the coefficient of Consumer Price Index (X1). C(6) and C(7) are the coefficicient of the Interest Rate (X2). C(8) and C(9) are the coefficient of Exchange Rate (X3). Lastly, the coefficient of Money Supply (X4) are C(10) and C(11). In VECM, Wald Statistics method was used to test the short-term causality.

Table 8 - The Result of Wald statistics method in VECM

VARIABLES	Null Hypothesis	Chi-Square P-Value
X1 {C(4) and C(5)}	C(4)=C(5)=0	0.0641
X2 {C(6) and C(7)}	C(6)=C(7)=0	0.2845
X3 {C(8) and C(9)}	C(8)=C(9)=0	0.4100
X4 {C(10) and C(11)}	C(10)=C(11)=0	0.8071

Source: data processed, 2016

Table 8 shows the result of Wald Statistics method in the VECM in order to determine whether a certain independent variable has a short-term causality towards the dependent variable. Based on the Table 8, the p-value of chi-square of X1 was 0.0641 which was greater than 5%. It means that the Null hypothesis cannot be rejected. When the Null hypothesis cannot be rejected, it means that there is no short- run causality running from the consumer price index to the Indonesian Sharia Stock Index. The similar case happened to the other three independent variables where the p-values of the chi-square of the variables interest rate, exchange rate, and the money supply, are higher than the critical level at 5%. Therefore, we can conclude that none of the independent variables has a short-term causality running to the dependent variable. However, even though there is no short-term causality running from the independent variables to the dependent variable, there is a long-term causality running from the independent variables to the dependent variable.

The next procedure is conducting Vector Error Correction Model (VECM) to determine the short-term relationship between the dependent variable and each of the independent variables. Assuming one co-integrating

vector, the short-term and long-term interaction of the underlying variables the VECM has been estimated based on the Johansen's Co-integration methodology (Naik 2013). The result of the Johansen's Co-integration test shows that there is a long-term relationship between the dependent variable and the independent variables. The estimated co-integrating coefficients for the dependent variable (Y) based on the first normalized eigenvector are as follows:

$X_t = (Y_t, X1_t, X2_t, X3_t, X4_t)$

$B_1 = (1.0000, 0.1541, -12.1252, 0.0422, -0.0001)$

The variables above were modified into log transformation which the values represent the long-term elasticity measures. Therefore, the equation of the co-integration relationship between the dependent variable and the independent variables can be shown as follow:

$$Y = 102.67 – 0.1541X1 + 12.1252X2 – 0.0422X3 + 0.00001X4$$

t-statistics (1.02) (-4.40) (10.4) (-12.8)

The coefficient of X1 (consumer price index) shows that it has an insignificantly negative relationship with the dependent variable, Indonesian Sharia Stock Index, while the X3 (exchange rate) also has negative relationship with Indonesian Sharia Stock Index, but it is significant. X2 (interest rate) and X4 (money supply) positively affect Indonesian Sharia Stock Index. An insignificantly negative relationship between Indonesian Sharia Stock Index and consumer price index (proxy for inflation rate) is consistent with Hosseini *et. al* (2011) and Jiranyakul (2009) who found similar results for India and Thailand cases respectively. The result of X4 (money supply) towards the dependent variable is consistent with Naik (2013) and Jiranyakul (2009) who had the same results for India and Thailand as well. As for the result of Indonesian Sharia Stock Index and exchange rate, it is consistent with Talla (2013) who studied about the Stockholm Stock Exchange (OMXS30). The result of interest rate towards Indonesian Sharia Stock Index has the same result as in the case of China by Hosseini *et. al.* (2011).

Conclusion

The purpose of this study is to observe the relationship between the Islamic stock index in Indonesia and the macroeconomic fundamentals by examining the Indonesian Sharia Stock Index and four macroeconomic fundamentals, namely, the consumer price index - the proxy for inflation rate, interest rate, exchange rate, and money supply. The conclusions of the study found that the consumer price index using proxy for inflation rate, cannot be a reference to determine the Indonesian Sharia Stock Index (ISSI). According to Talla (2013), the negative relationship between inflation and stock price can be explained by the fact that additional funds flow due to inflation increase the supply in the stock market index while the demand side remains unaffected. This static circumstance on the demand side of the security market puts downward tension on the stock price index. However, in this study, inflation rate is shown to be an insignificant variable in determining the Indonesian Sharia Stock Index.

Meanwhile the interest rate is shown to be supporting the incline of ISSI. This is a special case, because it tends to influence the stock index negatively. However, In Indonesia, conventional financial system is seen to be more dominant compared to Sharia financial system. Therefore, the impact of interest rate runs towards the conventional stock index more rather than towards Sharia stock index. The study found that interest rate supports the incline of Indonesian Sharia Stock Index. Because when Bank Indonesia, the central bank of Indonesia, decides to increase BI rate which directly influences the interest rate, people will tend to save their money on bank rather than invest the money. Other people will see a potential from the Sharia stock. Therefore, they move to invest their money on the Sharia stock. This case is very special, because Indonesia has dual financial system, namely conventional financial system and Sharia financial system. However, in Indonesia, conventional financial system is still more dominant compared to Sharia financial system. Therefore, when the potential of conventional stock declines, people might see a good potential on the Sharia stock.

The depreciation of rupiah towards US dollar indicates the poor condition of Indonesian economy. This condition will give a disadvantage impact towards firms. The study found that the depreciation of rupiah towards US dollar will cause the Indonesian Sharia Stock Index to decline, because when rupiah depreciates against US dollar, it means that the economic condition in Indonesia tends to be poor at the time. Therefore, investors will sell their stocks or bonds in droves instead of keeping them, because the investors see the potential of foreign stocks and bonds to be more profitable. Money supply, like interest rate, supports the incline of Indonesian Sharia Stock Index. This is a normal case of money supply towards stock index.

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Accounting and Analytical Procurement of Predictive Appraisal of Synergistic Effect in Small Business Construction Companies

Liliya Alexandrovna ZIMAKOVA
NRU BSU - Belgorod National Research University[8], Russia
zimakova@bsu.edu.ru

Svetlana Nikolaevna KOVALENKO
NRU BSU - Belgorod National Research University, Russia
kovalenko_s@bsu.edu.ru

Alla Alexandrovna UDOVIKOVA
NRU BSU - Belgorod National Research University, Russia
udovikova@bsu.edu.ru

Natalia Nikolaevna KRAVCHENKO
NRU BSU - Belgorod National Research University, Russia
kravchenko_n@bsu.edu.ru

Victoria Borisovna MALITSKAYA
Plekhanov Russian University of Economics[9], Russia
vmrussian@yandex.ru

Abstract:

The need to form the synergy is observed in the event of circumstances related primarily to cost saving, increase in market prices, etc. Notably, the interested user groups exercise their own approach to the assessment of financial results. This study is aimed at the formation of accounting and analytical systems of predictive consolidated balance sheets, in accordance with certain trends of the synergistic effect. Based on this, the cluster analysis combined with the analysis of the portfolio of works performed by the development and construction companies was carried out, the business strategies and their relationship with the accounting processes were defined, the main trends of preparation and evaluation of the synergistic effect were formed, the value chains were analyzed.

The steps formed in the framework of assessment of the predictive synergistic effect predetermine the direction of the emergence of the synergistic effect and the speed of calculation of the predictive economic effect by the trends, and determine the impact of the planned operations on the financial condition of the development and construction company and the net asset value, allowing to make the right management decision.

The formation of the main trends of the synergistic effect is aimed primarily at harmonization of accounting and analytical information as the basis for the competent business management.

Keywords: synergistic, management, tax, costs, accounting and analytical procurement, business strategy, accounting system.

JEL Classification: M21, M41.

1. Introduction

The dynamic changes in the economic conditions necessitate the search for new business opportunities and additional profits. This takes into account both external and internal resources. While the large companies have already been receiving, the small businesses are just looking for the ways to receive the effect from the complementarity of the units and services, the use of participatory management style, the use of common resources, the development of new products and everything else that creates the synergistic effect.

A few years ago, the construction business was being developed actively in Russia, bringing effortlessly large profits, but today the situation changed. High competition, changes in approaches to the selection of contractors and credit policy of banks, lack of equity, reduction of real income and certain other factors had an impact on the issues related to a profit making in this field of industry. Therefore, the time has come when the generation of additional income became the essential problem for the development and construction companies.

The possibility of the emergence of synergy is expected at the confluence of certain circumstances; very often it is expressed in cost saving, growth in market prices, etc., and therefore the problem of the synergistic effect

[8] 85 Pobedi Street Belgorod, Russia, 308015
[9] 36 Stremyanny per., Moscow, Russia, 117997

assessment against the general search of synergy is of particular relevance. At the same time, it should be noted that the shareholders, investors, founders, managers, economists and other interested groups have different approaches to the financial result assessment criteria. It can be the difference between revenues and expenditures, the capital gains, increase in the value of the company, the growth of net assets, the net inflow of funds, etc. Another problem lies in the differences between the companies by size, type of activity, management style and industry characteristics.

All this makes it necessary to develop modern approaches to accounting and analytical procurement of predictive appraisal of synergistic effect drawing.

2. Methods

Business processes modeling through the development of predictive financial statements is not a new area of expertise, and this process in the economics has been paid and is paid great attention. Joseph E. Stiglitz noted that "the competitive model essentially transformed the economic science into the engineering industry (do not consider it a diminishment of this noble profession) and all participants in the economic process into a little better or a little worse engineers" (Stiglitz 2005, 366).

The traditional consolidated balance sheets were taken as the basis of modeling, as a source of generalized information about the company focused on the possibility of obtaining of the additional profit at the expense of domestic reserves.

The development and construction companies, relating to small businesses, were taken as the subject of this study. The mathematical methods were used for appraisal of the prognosis for the synergistic effect drawing in certain trends. This allowed to justify the relationship between the size of the company and portfolio of services provided, with a view to the most appropriate determination of possible business strategies and strategic components, as well as more correct estimation of the predictive synergistic effect.

The obtained result was used as the basis for drawing up the predictive consolidated balance sheets, taking into account the time, the assessment and the breeding place of the said effect. Given this, the accounting modeling based on engineering approaches, asserting the enlarged reflection of the outcome of the planned operations, was used. The interpretation of possible business operations subject to the rules of accounting and reporting allows to evaluate more accurately the certain aspects of the predictive results of the construction companies.

Assuming that the capital increment factor is one of the most important elements of the company's value, and the residual cash flow is valuable for business owners, the hypothetical accounting records, asserting a fair evaluation of assets and liabilities and the ability to turn them into cash, were used for objective assessment of these factors.

3. Results

The problems of compilation of predictive financial statements were considered by many domestic and foreign authors. Since no uniform methodology for compilation of predictive financial statements was found, each author amends it, offers the hypotheses underlying its construction and approaches to the objective assessment of the factors. Based on the results already achieved, the model of accounting and analytical procurement of predictive appraisal of synergistic effect in small business development and construction companies, including a number of successive stages, was developed.

The proposed model combines the mathematical methods and principles of accounting. From a theoretical point of view, it is complementary to existing forecasting methodology, making the adjustments to the assessment of the potential drawing of the synergistic effect; from the practical point of view, it accelerates the decision-making process, allowing to assess objectively the predictive financial result.

4. Discussion

The main stages of the model of accounting and analytical procurement of predictive appraisal of synergistic effect in small business development and construction companies.

Definition of the initial operator

Any forecast shall be based on available capacity and resources, as well as rely on the selected financial policy. All this is reflected in the consolidated balance sheets. The consolidated balance sheets are the model drawn up according to the certain rules in order to assess the financial and property status of the company; that is why the standard consolidated balance sheets are recommended by many economists as the basis for predicting. Kotler, Goedhart and Wessels (2005, 685) emphasized that, as in any assessment, it should be started with the

preparation of the predictive profit and loss report and the balance sheets, moving from them to the cash flow forecasting.

The net assets and the capital increment are taken as the evaluation criteria. It should be noted that, according to Doyle's research (2001, 18) "the average company is not able to maintain the profitability above the capital value for more than 7-8 years".

Performance of the cluster analysis in conjunction with the analysis of the portfolio of works performed

In the course of the study and identification of possible trends of growth, taking into account all the factors affecting the operation of the company (Damodaran 2006, 309), it is necessary to identify the typical analytical factors of functioning for comparable companies. The study of development and construction companies was based on the varieties set of certain characteristic features: the number of employees (up to 100 people), the number of types of works performed, the availability of the proprietary special equipment, the proceeds (up to 800 mln. rub.), operating at the regional level (due to the knowledge in the specifics of the economic environment, customer requirements and business details).

The correctness and objectiveness of the selected features can be assessed based on the analysis of variance. The raw data are shown in the Table 1. The results are shown in the Table 2.

Table 1 - The varieties set of characteristics of the portfolio of works performed of the studied development and construction companies, units

Characteristic of the company	Number of the employees 1-15 pers. (individual civil construction)					Number of the employees 15-50 pers. (industrial construction)					Number of the employees 50-100 pers. (construction of apartment buildings)				
Performance of the civil works	9	8	7	11	8	11	12	11	12	11	16	15	17	16	12
Performance of the works complicated by the engineering services	12	13	11	11	12	17	19	18	17	18	21	19	21	22	20
Performance of the civil and engineering works with complicated elements	24	19	25	22	22	28	27	30	27	30	25	24	23	25	25
Performance of the works complicated by the engineering services with finishing	14	16	12	14	14	19	20	20	19	19	23	19	22	23	22
Performance of comprehensive multi-industry construction works	49	38	42	47	44	49	53	54	50	47	46	44	39	40	48

Table 2 - Assessment of the relationship between the number of the employees of small business development and construction companies and the number of services provided

STAGE	Formula for calculation	Calculation results	
1. Calculation of the average number of types of works performed by each activity type in the studied group of comparable development and construction companies ($\bar{Q}_{av.i}$) (based on a specific set of activities (n))	$\bar{Q}_{av.i} = \frac{\sum_{j=1}^{n} Qi}{n_i}$ $\sigma_i^2 = \frac{\sum(Q_i - \overline{Q_{cpi}})^2}{n_i}$	$\bar{Q}_{av.1} = 110.8$	$\sigma_1^2 = 26.16$
		$\bar{Q}_{av.2} = 127.6$	$\sigma_1^2 = 13.44$
		$\bar{Q}_{av.1} = 125.4$	$\sigma_1^2 = 13.04$
2. Determination of the average number of the types of activities performed in the studied group of comparable construction companies (Q_{total})	$\bar{Q}_{total} = \frac{\sum_{j=1}^{m} \bar{Q}av._i \cdot n_i}{\sum_{j=1}^{m} n_i}$	$\bar{Q}_{total} = 117.93$	
3. Calculation of the average intragroup variance ($\bar{\sigma}^2$)	$\bar{\sigma}^2 = \frac{\sum \sigma_i^2 \cdot n_i}{\sum n_i}$	$\bar{\sigma}^2 = 17.54$	
4. Calculation of the intragroup variance is performed (shows the variation of the characteristic, which is manifested under	$\bar{\delta}^2 = \frac{\sum (\bar{Q}_{av.i} - \bar{Q}_{total})^2 \cdot n_i}{\sum n_i}$	$\bar{\delta}^2 = 147.58$	

STAGE	Formula for calculation	Calculation results
the influence of factors laid in the basis of classification) ($\overline{\delta^2}$)		
5. The correctness of the choice of the factor characteristic is verified based on the rules of addition of variances (σ^2)	$\sigma^2 = \bar{\delta}^2 + \bar{\sigma}^2$	$\sigma^2 = 130.04$
6. The empirical correlation ratio (η) is calculated	$\eta = \sqrt{\frac{\bar{\delta}^2}{\sigma^2}}$	$\eta = 0.367$

The calculation results show that the relationship between the number of the employees of the small business development and construction companies and types of services rendered is rather strongly expressed. Therefore, within all subsequent stages this dependence should be considered.

The definition of the business strategies and their relationship with the accounting processes. At this stage, the coordination of the chosen business strategy and the available resource capacity of the development and construction company shall be performed for its implementation.

The information about the costs of the company is a trade secret, so in the framework of the study the collection of the detailed data on a separate contingent of construction companies, included in the sample performed in the 2nd stage, was carried out. Laden Aldin (2010) concludes the importance of empirical research and the possibility of re-use (multiple use) of previously developed business models. Therefore, the possibility of distribution of the results for the companies of the industry with similar characteristics is allowed.

The exposure to changes in the business structure involves the expansion of operations to cover the market entry strategies, processes, and assets of one or more companies. The performance of the predictive calculations requires the integration of analytical accounting characteristics for the entire company: the customers, the suppliers, the products, etc. and the separate accounting of assets, liabilities for each segment.

The studies performed by Kathleen A. Bentley, Thomas C. Omer, Nathan Y. Sharp prove that business strategies are associated with different risks, they have an impact on performance and distortion of the financial statements, a focus on individual factors and indicate the need for in-depth attention to the development of the strategies during the audit, classifying the companies and their business risks (Bentley *et al.* 2013). The business strategies influence all aspects of the activity, but let us highlight the most essential ones in the view of accounting and analytical procurement:

- strategic asset diversion and change in the trends of their use to obtain the additional effect from the sharing (these operations can be predicted with the reasonable accuracy, in case the flexible analytics, cross-cutting process transparency were applied within the accounting system);
- organic growth carried out by expanding the activities of the company (possibility of business strategy prediction is related to the information database scalability, availability of the advanced multi-level analytics capable of being supplemented, the linkage of the accounting system with the technology and business processes);
- innovation as a stimulus to growth (the creation of a virtual production within the accounting system, allowing to predict the results of this development trend, is expected).

The volume and quality of the information accumulated depend on the software product capacity, the accounting system used and the level of detail. The use of a modular billing plan in the framework of an integrated accounting system based on the multi-valued interconnected coding of the billing of the financial, management and tax accounting will in the optimum way provide the chosen strategy with the information, allowing to predict its impact on the financial results, the property and financial condition, the tax implications (Zimakova 2015).

Strategic components:

- Evaluation of the business structure. The obtainment of the synergistic effect is possible with a flexible system of organization of the activity of the company, through business process reengineering, diversification, capital evacuation, liquidation, etc. Tirole, J. (2000, 27-28), considering the company as a static synergy (in the framework of the theory of industrial organization), pointed out that one of the major determinants of firm size is the extent of its use of economies of the scale or the scope. Creation of large multi-function firms with unitary U-shaped form of organization (with a lot of units) and rearrangement of units according to their function can be regarded as an attempt to use the potential economies of scale. At this stage, the assessment of the business is

performed prior to any activities based on the factors: the swap ratio; the current liquidity ratio; the independence ratio; the revenue per asset.

- Analysis of the value chain. This analysis allows the identification of possible trends for obtaining the synergistic effect. The value chain is focused on the processes occurring outside the firm, and each of them is considered in the context of the overall chain of business activity, creating the value (Nikolaeva 2003, 53).The issues related to the necessity of the value chain analysis have been considered by many authors. Shank and Govindarajan (1992) recommended the methodology for conducting of this analysis with analogs in conjunction with the industry characteristics and the definition on this basis of the competitive advantage. Drury (2007, 848-851) complements this analysis, justifying the need for implementation of the cost management principles within the whole value chain). The use of a simulation model of the market as part of this analysis allows to predict the reaction of competitors and identify the more profitable type of integration – vertical or horizontal. The analysis is carried out by the following trends:
  - the macro environment: the global economy, technology, policy, legislation, demography, natural environment, society, culture;
  - the micro-environment: the customers, competitors, suppliers (Doyle 1999, 19);
  - the internal environment: the analysis of the level of technological development, the determination of the level of specialization of the company, the calculation of the competitive growth index, the calculation of the current competitiveness index.

The performance of this analysis should be based on fundamental principles: the nonlinearity of the synergistic effect (the lack of proportion dependence onany factor), the coherence (the cooperation and interaction), the openness (inflow and outflow of cash flows, resources within the system and from the external environment), the prediction of performance in different economic situations.

- Identification of the trends for the obtainment and evaluation of the synergistic effect. The obtainment of the synergistic effect in various areas have been considered by many authors: Fleck, Boguslavskiy, Ugnich (2014), Savelyeva (2012), which highlight the necessity to take into account the industry-specific characteristics. Pekuri, A., Pekuri, L. and Haapasalo, H. (2013) consider the synergies problem especially in the construction industry and in creation of a business model, providing the specific customer segments, *i.e.* the customers and the users in specific areas, with the maximum value. Kaplan and Norton proposed the use of the balanced scorecard system for the purposes of appraisal of the synergistic effect (2006). Developing this trend, Khanova (2010) recommends to perform the appraisal based on the percentage of the factors, improving the efficiency of the integrated enterprise. Some authors consider the appraisal of the synergistic effect in terms of the impact on the financial statements.

We proceed from the necessity of mathematical evaluation of the predictive synergistic effect and determination of its impact on the increase in value of the company and improvement of the cash flow. Given this, the task of the analyst is to assess properly the interrelation and interdependence of the elements of the organization and types of activity, and to project them on the financial statements. To solve this problem, it is necessary to create a model of accounting, based on contingency planning, that is, a specific version of the projected situation is developed, and the results are reflected in the derivative consolidated balance sheets.

The cash flow assessment is important in terms of the calculation of the technical solvency, having the impact on the credit rating of the company, which is particularly important for the development and construction companies relating to small businesses. Higgins and Scholl (1975) attribute this effect to the mutual debt insurance. But, in their opinion, sometimes these benefits are obtained at the expense of the shareholders, bearing losses in the merger process, so the mutual insurance effect does not create any new value, but merely redistributes the benefits between the providers of the capital of the company. The studies have shown that all of the 15 studied companies carry on their business at the expense of the borrowed funds. Therefore, it is necessary for them to monitor the solvency factor. The diversification of the portfolio of services rendered in the construction industry may slow the turnover of funds and increase the need for capital, proving also the necessity of cash flow assessment.

Let us consider the different trends of obtaining the synergistic effect by the small business enterprises in the construction industry.

The synergetic of costs. This type of synergetic is formed by the joint use of the equipment and personnel for several products or types of activity, reduction of the duplicate departments and productions. Making the most of its capabilities (production facilities, personnel, administrative areas, etc.) the company at the same time in different trends gains the additional synergistic effect through the marginal costs lowering. This follows from the

subadditivity of the cost function. At this stage, the correlation of costs and capital is observed (see Figure 1), which implies that the cost saving results in the increase in the capital value.

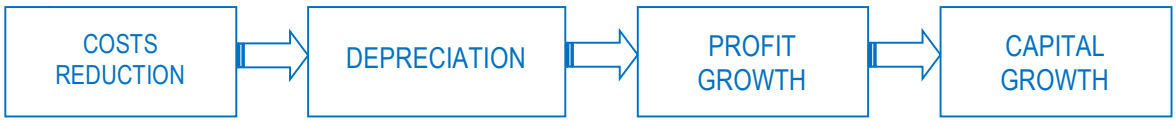

Figure 1 - Interconnection of the costs and capital

The synergetic of costs leads to a reduction in the time for the construction of the individual objects, which implies a decrease of fixed costs within the relevance time range and of other expenses related to a specific building object. In construction, the relevance time range costs include the cost of operation of the special equipment, which can be represented by the formula:

$$FC_t = A_t + \sum_{i=1}^{n} ZC_i \quad (1)$$

where FC is the costs of machinery and equipment within the period *t*, A_t is the amount of depreciation within the period t, ZC_i is the operating costs for special equipment engaged in the service rendering, *n* is the number of services rendered using the special equipment within the period.

The amount of depreciation of the special equipment within the period t can be represented by the formula:

$$A_t = \frac{OC}{N} \quad (2)$$

where OC is the gross fixed assets, N is the period of operation of the gross fixed assets.

The costs of construction machines and mechanisms are related to the number of services rendered (n) and time spent for the service rendering (T); based on that the costs attributable to one service can be defined as follows:

$$FCq = \frac{At}{n} + \sum_{i=1}^{n} ZC_i \div t \times T \quad (3)$$

where *T* is the time spent for one service rendering, *t* is the possible operation time of the machines and mechanisms within the reporting period.

The calculations performed show that when assessing the costs of machinery and equipment per one service, the amount of them will be decreased with the increase in the number of services provided through the redistribution of the total amount of depreciation. The technological synergetic. It manifests itself in connection with the application of modern technologies in various fields, originally not intended for these areas. The technological synergetics will lead to the reduction of the variable costs per operation, both due to the price factor and reduction of the time spent for such operation. The variable costs amount can be represented by the formula:

$$VC_t = \sum_{i=1}^{n} (m_{it} \cdot P_{it} + Z_{it} \cdot Q_{it}) \quad (4)$$

where VC_t is the variable costs in the period, m_{it} is the material costs per operation to render the service in the period t, P_{mit} – the cost of the unit of the material used for the operation, Z_{it} – the price of a single operation, Q_{it} – the number of operations.

The technological synergetic will influence the reduction of material costs in physical volume (m_{it}) and the reduction of the number of operations (Q_{it}). Given the trends of innovation development of building technology and the possibility of modern construction materials use, there is a real opportunity to reduce the costs.

The management synergetic appears as a result of business combinations (business combinations are one of the varieties of the integrative transactions, manifesting in unification of the separate enterprises into one economic entity, obtaining the control over several types of businesses).The participants of investment and construction activity: the investors, the customers, the designers, the general contractors, the subcontractors, the manufacturers of the material and technical resources, the logistics companies, the owners of the special equipment, etc. The composition of the participants of the investment and construction activity is diverse and can be changed, mostly, due to the increase in the number of sub-contractors, as schematically shown in Figure 2.

In assessment of the prospects of the management synergetic development, the association of the elements can be distinguished into a single system as the business combination variant. Given this, the

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construction company acquires a significant importance in the industry (in the region); it becomes possible to use the corporate externality and transfer prices, etc.

Figure 2 - The scheme of participants of the subcontracting companies in the performance of works

Given the large number of construction activity participants (Figure 2) and the fact that each subcontractor receives 20% of the profit of the cost amount, the formation of profits on each level can be described by the following formula:

$$\mathrm{EBIT} = 0.2 \cdot \sum_{i=1}^{\mathrm{L}} \mathrm{TC1_i} \quad (5)$$

where TC_{1i} is the total cost for the service rendering, L is the number of participants (services) at each level, J is the number of sub-levels.

$$\mathrm{EBIT_j} = 0.2 \cdot \sum_{i=1}^{\mathrm{L}} \mathrm{TC1_{Ji}} + \mathrm{EBIT_{j-1}} \quad (6)$$

where $EBIT_J$ is the profit obtained at the level J.

By reducing the number of levels and the number of participants the costs are reduced in the form of savings from the profit of each participant. In case of performance of all types of work by one company, there is an additional opportunity to make a profit. The synergistic effect is possible due to reduction of the overhead costs.

The presence of management synergetic is confirmed by the studies carried out by many scientists. Kruehler, Pidun and Rubner (2012) developed the elements of corporate strategy, involving the interaction of the corporate center managers and business units, allowing to create an effective combination of activities to create the value. Weitzel and McCarthy (2011) proved in their research the possibility of the obtaining of the additional effect from the diversification of activities, as well as the mergers, relating specifically to small businesses Hoberg and Phillips (2010) performed the research on the issues of the obtaining of the synergistic effect from the complementarities in the merger and acquisition of enterprises and companies, evaluating the effectiveness by the stock returns, the predictive profitability and operating income.

In assessing the prospects of the management synergetic development, let us select the following business combinations: the unification of the elements into a single system, unbundling.

The company's growth beyond the industry (diversification) involves the creation of conglomerates. The studies, performed by Scherer and Raivenscraft (2004, 27) show that conglomerate mergers gave a higher gain relatively to non-conglomerate mergers, with significant gain registered by the shareholders of the companies-vendors and the moderate gain achieved by the shareholders of the buying companies. Such unification has

several features: first, at the acquisition of a controlling stake in the firm, the buyer is obliged to pay a premium (due to the fact that the controlling stake implies the existence of control over the activities and the possibility of a synergistic effect), and secondly, the securities transactions involve some costs.

A premium paid for the controlling stake is a payment for private benefits from the control described above. The spread of the premium can be fantastically high, but in most countries it is in the range of 10-20%. According to the study performed by L. Zingales, the premium for the right to make a decision is inversely proportional to the accounting rules quality index in each country (Finance, 1998, 67).

Another difficulty lies in the fact that all the costs of the merger (premium and costs) will be incurred in one period, and the benefits from the merger can be obtained much later, so it is necessary to take into account the changing of the value of money over time and to carry out the discounting in order to obtain the most truthful information about the size of the synergistic effect.

The unbundling suggests that the units, generating the least income and having no substantial impact on the other units of the company, *i.e.* not correlated (in the case of the relationship the analysis of the profitability of the production or the purchase of semi-finished products, hand tools, etc. shall be performed) are identified by the analysis. These units are sold and only those units that generate a sufficient profit margin are kept. As the result of the reduction of the less efficient units the profit leap appears.

The unbundling can be implemented:

- by division (one firm is divided into two new) A = B + C;
- by separation (one firm is separated from the main firm) A= A + B.

The financial synergetics is manifested in the increase in the value of investments through the use of financial instruments. At this stage, it is advisable to use the method of financial asset analysis proposed by Chirkova, Buhovets, Malitskaya (2014), including the descriptive analysis, component-by-component asset analysis, the calculation of values of pair correlation and regressive dependence of the receivables on the financial assets.

In the course of the analysis, it should be taken into account that in order to resolve the financial problems the development and construction companies use both traditional methods – obtaining credits, loans, prepayments from the customers and creation of subsidiaries in the field of housing and utilities infrastructure (HUI) and use their financial resources to increase the current capital.

The tax synergetics – the use of different tax schemes and participation in associations of companies with different tax systems – allows not only to save significantly on taxes, but also offers the customers more favorable conditions for cooperation. Table 3 shows the average data for the studied companies with the total income up to 100 mln. rubles. For the companies using a simplified taxation system, the difference between the revenues and the costs was chosen as the object. The small businesses in construction industry utilize a variety of schemes, allowing to increase the costs accounted for taxation purposes. The peculiarity of the Russian tax legislation is that in case the amount of tax payable under the simplified system of taxation, calculated by the formula "income minus costs", amounts to less than 1% of the income amount, the company shall pay the minimum tax equal to 1% of the revenue. This loophole in the legislation is used by the small businesses to reduce the tax burden.

Table 3 - The tax rates payable by the companies in due to the different taxation systems in Russia

Taxes and fees	General tax system		Simplified system of taxation	
	Tax/fee amount, %	Sum, thousand rubles	Tax/fee amount, %	Sum, thousand rubles
VAT	18%	2,160	-	
Contributions to non-budgetary funds	30% (of the amount of salary)	4,500	30% (of the amount of salary)	4,500
Additional contributions to the pension fund	2% and 4%(of the amount of salary)	300	2% and 4% (of the amount of salary)	300
Insurance contributions on occupational accidents	0.2-8% (of the amount of salary)	300	0.2-8% (of the amount of salary)	300
Property tax	2%	60		
Tax on profit / single tax due to the use of a simplified tax system	20%	1,200	6% (of the amount of profit) or 15% (of the difference between profit and cost) or 1% (of the amount of profit)	1,000
TOTAL		8,520		6,100

The data specified in the table show the opportunity to save on taxes due to the changes in the taxation system used.

Preparation of the predictive consolidated balance sheets for the general manager

The studies performed by Wolmarans and Meintjes (2015) demonstrate the importance for the managers of small and medium-sized companies of the enlarged assessment in terms of cash flow formation and correct assessment of the current capital, excluding small details. Mihai (2009) offers the approach to the preparation of the predictive financial statements based on the relationship of internal and sustainable growth, suggesting the presence of three hypotheses: constant capital structure, capital growth only due to retained profit, preservation of the current dividend policy.

The possibility to obtain and reflect the synergistic effect of benchmarking in the accounting and derivative consolidated balance sheets was characterized by Kuznetsova (2011). The possibility to use the system of derivative of balance sheets to produce on their basis the aggregated and disaggregated indicators of the net assets and net liabilities ownership, allowing to create the effective system of accounting and the economic processes and resource potential of the company management as a source of synergistic effect was considered by Aksenova (2011). Bogataya (2008) stresses the need to use the derivative consolidated balance sheets in the framework of strategic management accounting, for the purposes of performance measurement of the process-oriented management.

Based on the studies conducted by the above economists, we consider it appropriate to assess the predictive effect in terms of the impact on the balance factors, so at this stage there is the need in the preparation of the predictive consolidated balance sheets, including the preparation of the hypothetical transactions.

It was noted earlier that in case one of the performance factors of the company is the increase in the capital value, then all transactions should be considered through the prism of decrease or increase of the capital. That is, if the profit is predicted as the result of the operation, it will lead to an increase in the capital, the converse is also true. The capital gains depend on three factors: the cash flow, provided by the strategy, the capital value, used to implement the strategy, and the market value of the liabilities, *i.e.* in the course of preparation of the consolidated balance sheets for assessment of the synergistic effect, it is necessary to comply with the following rules:

- the asset assessment should take into account the real ability to generate the cash flows (for this assessment it is permissible to use the discount or expert assessment);
- the liability assessment rules should be similar to the principles of asset assessment.

The problem is that the factors of the consolidated balance sheets prepared by the small businesses are very far from the market or the actual assessment. For example, the asset assessment is performed by the Russian development and construction companies at historical cost. The possibility of revaluation is permitted by the regulatory enactments, but the revaluation leads to an increase in the value of non-current assets, and this has a direct impact on the increase of the property tax. The revaluation in British companies leads to a decrease in the value of assets (Walton 2003, 169). The opinion of the credit institutions on the property, which is evaluated by their representatives at the liquidation cost, should be taken into account. Thus, the majority of the external users have the distorted information provided by the small businesses in their traditional consolidated balance sheets.

The derivative consolidated balance sheets assume the hypothetical revaluation in order to obtain the actual information on the assets and liabilities. It requires obtaining the additional external information on the market value of the assets (the actual value may correspond to the replacement value, ensuring the stability of the asset assessment).

The next step is the registration of the predictive synergistic effect. Table 4 shows the example of the hypothetical accounting transactions, reflecting the predictive synergistic effect.

Table 4 - The calculation of the synergistic effect on the basis of accounting transactions at the expense of the cost reduction

Balance sheets sections	Accounting transactions in normal terms		Hypothetical accounting transactions, reflecting the cost synergetic	
	Debit	Credit	Debit	Credit
Non-current assets				
Current assets	1)500 2)500 3)700	 2)500 3)500	1)300 2)300 3)700	 2)300 3)300
Capital		500		500

Balance sheets sections	Accounting transactions in normal terms		Hypothetical accounting transactions, reflecting the cost synergetic	
	Debit	Credit	Debit	Credit
		3)200		3)400
Long-term liabilities				
Short-term liabilities		1) 500		1)300
Net assets	200		400	
Capital gains		200		400

Note: 1) the acquisition of materials, 2) the use of materials in the production process and production of the product in the assessment at the actual cost, 3) the sale of the product to the buyer and the determination of the financial result).

The data, specified in the table, show that the cost reduction results in the reduction of the accounts payable, having the direct effect on the growth of the net assets, and, as a consequence, the release of funds and the growth of the capital value.

Conclusion

Preparation of the derivative consolidated balance sheets by the small businesses of the construction industry, given the above requirements, allows to perform the appraisal of the predictive synergistic effect from the point of view of the influence on the balance sheet factors and capital gains. The increase in asset turnover, the release of funds can be observed as the additional effect.

In the course of decision-making, the minimum amount of assets allowing the receipt of the maximum profit should be calculated; for this purpose, the parametric analysis of the assets used should be performed, the unused assets should be disposed, their structure should be updated. It is advisable to take into account the concept of financial leverage effect: the change of the value and the return of the assets results in the change in cash flow, which, in turn, allows to save on interest on borrowings and therefore leads to the capital growth.

The phased appraisal of the predictive synergistic effect allows to determine the trend of the synergistic effect, to calculate quickly the predictive economic impact by the trends and to determine the impact of the planned operations on the company's financial condition and the net asset value, which reflects positively in the results of the decisions made.

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Project Valuation of a Distribution Centre of an Auxiliary Rail Freight Terminal: Using Real Options with Fuzzy Logic and Binomial Trees

Fernando CRUZ-ARANDA
ECEE, Universidad Panamericana, México
fcruz@up.edu.mx

Francisco ORTIZ-ARANGO
ECEE, Universidad Panamericana, México
fortizar@up.edu.mx

Agustín I. CABRERA-LIANOS
UPIBI, Instituto Politécnico Nacional, México
acabrerall@ipn.mx

Abstract:

This paper presents the financial evaluation of the extension of an auxiliary rail freight terminal to integrate it to a logistics platform (LP). This investment phase is focused on building a distribution center (CEDI), as part of a comprehensive project of high commercial and strategic impact for Mexico. The project evaluation is done using binomial trees for the valuation of an American type real call option, incorporating the expected volatility over the expected cash flows, in order to determine the benefit of postponing the project three years. In addition, to complement this real option valuation, we incorporate the fuzzy logic theory in the process of assigning probabilities to the branches of tree. The value of the American type real call option to postpone the project three years is 30.37% of investment, while the value of real option, using fuzzy logic is 29.94% of investment, this is a better result.

Keywords: project evaluation, real options, binomial trees, fuzzy logic.

JEL Classification: C63, C65, G13, H43.

1. Introduction

Logistics is a strategic resource to generate competitive advantages, which in turn foster the integration of global supply chains (that move goods across the border quickly and reliable), that is delivered to end customer the right product in the right place, at the right price, at the right time, at the lowest possible cost. The synchronization of the activities of multiple organizations participating in the logistics chain and transport, allows the emergence of complex logistics systems, based on synchronization process and feedback of information that give rise to multimodal transport schemes, defined according to the load characteristics, time, distance and geography that must travel and take advantage of each mode of transport for the benefit of the competitiveness of the load transportation.[10]

This type of processes leads to improve productivity of transport operations to move significant volumes of cargo between two logistics platforms, and organize shipments combined loads to different customers in the area of influence of each platform. So, you have a better transport infrastructure that has efficient connectivity and a solid structure of logistics services seeking high logistics standard at lower costs and provide competitive advantages to attract investment for the country.

Within companies, the implementation of well-structured processes in which value chains "to provide value to customers and to the same company", Porter (2009) provides the competitive advantages that the company requires.

Evolution of logistics platforms

At present, the most advanced development of logistics centers and logistics platforms are in the European Union, whose international experience is the most extensive. Some highlights particularly in development of logistics infrastructure in countries like Spain, Italy, Denmark, Germany, Netherlands, and some Asian countries like Singapore, South Korea, Hong Kong and Malaysia.

[10] Plataformas Logísticas: Elementos Conceptuales y Rol del Sector Público. CEPAL, http://www.cepal.org/usi/noticias/bolfall/3/38123/FAL-274-WEB.pdf

Role of Mexican government in development of logistics platforms systems

According to the OECD, trade facilitation is crucial for economic development. Countries with better logistics can grow faster, be more competitive and increase their investment.

In 2013 SCT-DGTFM[11] gives an overview of the infrastructure of transport and trade in Mexico, logistics nodes and relationships, functional macro-areas, the logistics corridors and the proposed 85 strategic points for logistical boost along the country. Relations between production centers and consumption define functional areas in each region (Betanzo Quezada 1995). The objective of defining the national system of logistics platforms in Mexico, was in order to "strengthen the role of competitive export supply of Mexico by optimizing the processes of national distribution, ensuring proper coordination with the territory and its transport networks connectivity and nodes of foreign trade, "as documented in BID, SCT, SE[12] (2013). In 2013, the National Development Plan in the field of Communications and Transport is summarized in: Communicate to populations and to generate safe transfers; allow community access to services and markets; to connect public places such as schools and universities; improve productivity with competitive costs of communication services and transport; positioning Mexico as an international logistics platform.

The current trend in medium and large companies to locate their facilities is to do it through the lease of land and industrial buildings that are in real estate projects and industrial parks that offer comprehensive services and infrastructure for the establishment of industrial, logistics and commercial activities, as well as centers of high-tech manufacturing or distribution.

Mexico invests in infrastructure around 2% of GDP, while countries like Chile spend more than twice that amount, compared with Mexico, that country is 30% more competitive by international comparison, according to National Development Program NDP (2007-2012). Investment in Mexico in the last decade has reached 4.5% of GDP in infrastructure, NDP (2013-2018). It requires Mexico to provide a series of factors of competitiveness to strengthen their geographical, such as logistics and transport, enabling the reduction of production costs and distribution position. In Mexico there, various infrastructures that meet various logistics uses, ranging from corporate distribution centers (CEDI's) and urban, auxiliary cargo terminals, dry ports, to multimodal nodes. To date, the development of this kind of railway infrastructure has been mainly through private investment.

Mexico invests in infrastructure around 2% of GDP, PND (2007-2012), while countries like Chile spend more than twice that amount, a country that is 30% more competitive than Mexico in the international ranking. Investment in Mexico in the last decade has reached 4.5% of GDP in infrastructure, PND (2013-2018). If Mexico want to take advantage of its geographical location and strengthen their competitiveness, should significantly improve a number of factors, such as logistics and transport, enabling the reduction of production and distribution costs. In Mexico, there are, various infrastructures that satisfy many logistics uses, ranging from distribution centers companies' (CEDI's) and freight urban terminals, complementary to dry ports, until multi-modal nodes. In recent years, the development of such infrastructure, interconnected through the rail network has been developed mainly by private investment. It seeks to increase operational efficiency, security, logistics performance, contributing to trade facilitation, as well as higher levels of profitability of the terminals themselves.

In this research are presented a description, the evolution, the determinants and the government's role in the assessment of an extension of the current auxiliary rail freight terminal, to make it grow to a logistics platform (LP), through investment phases and how the first phase construction of a distribution's center (CEDI), to be a comprehensive project of high commercial impact in Mexico, through different methodologies of real options to be offer the power of flexibility for the investors when they consider this methodology in their decision-making in big investments, according to the type of projects to be considered for their evaluation. Is presented a brief description of two different methodologies to determinate a capital budgeting: the advantages and disadvantages of assessment and the investor's knowledge available, going from traditional methodologies as a deterministic net present value, to some real options methodologies that provides flexibility in their decision-making. Thus, as in a world of risk and uncertainty, it becomes prudent assessment of the options that could lead to the project as part of a strategic planning that affects in a beneficial way for the company to minimize as much as possible both elements. In addition, the incorporation of a fuzzy logic model into the traditional discrete-time binomial model, allowing operate and define the ambiguity underlying, through triangular or trapezoidal fuzzy numbers, particularly in order to estimate movements upward or downward as described (Zdnek 2010, Liao and Ho 2010, and Milanesi 2014). The various methodologies used to differentiate and analyze the results of the evaluation of logistics platforms provide to investors a more robust way for investment decision-making in uncertainty environments.

[11] SCT, Communications and Transport Ministry; DGTFM, General Direction of Rail and Multimodal Transport.
[12] BID (IDB); Inter-American Development Bank; SE, Ministry of Economy.

Thus, in this research it considered appropriate the approach of the following hypothesis: "The method of valuation of real options is a valuation methodology for investment projects which allows senior management to know the different alternatives related to the same investment project and the cost of various courses of action that can lead each". This represents an excellent alternative in the process of evaluation and acceptance of the initiatives presented to the authority, with aimed at developing projects logistics platforms, over a period of time *T-t*. With additional knowledge obtained to incorporate into its analysis the fuzzy logic, the evaluation is strengthened with its "verification or corroboration" presented in results and discussions section. In this way, it's possible to obtain a set of results that will allows to see different contributions and/or benefits in assessing logistics platforms, showing its limitations and scope, including recommendations from experts in different valuation periods of logistics platforms. However it should be noted that the valuation of the project can be assessed at any other time if it were considered desirable.

2. Methodologies for project evaluation

The methodologies for project evaluation through a traditional deterministic net present value (NPV) method, considering the weighted average cost of capital (WACC), as well as the real options methods that include the flexibility in the investment project are described.

2.1 Net present value of an investment project

Net present value of an investment project, $I_{0,}$ with expected cash flows FE_i and brought to present value at a rate represented by the weighted average cost of capital (WACC),r_{WACC}, it is given by:

$$NPV = -I_{0,} + \sum_{i=1}^{n} \frac{FE_i}{(1 + r_{WACC})^i}.$$

The NPV has the limitation of not providing flexibility in their decision-making of investors; one of the reasons is because it's a deterministic model. Therefore, for an investment project be feasible, the present value of expected cash flows discounted at r_{WACC} rate, should be greater than initial investment to keeping alive the investment option.

2.2. Real Options Method as an alternative to evaluation of investment projects

The technique of real options valuation (ROV) assumes that the world is characterized by change, uncertainty and competitive interactions between companies; and that their managers wish to have the flexibility to review and adapt future decisions in response to changing circumstances. Real options give to the executive the right, but not the obligation, to conduct certain business initiatives; which means added value for the investor, ie they provide a more informed decision on strategic projects, this is one of the reasons that ROV is a useful and powerful tool used in valuation of large investment projects. So, the use of ROV is very important in investment situations in which corporate managers want to be prepared to make the right decisions at the right time, (Dixit and Pindyck 1994). Stewart Myers was one of the first to use the term of Real Options in 1984, in his book "Finance Theory and Financial Strategy"; the pioneers of the use of this technique were the developers of mining and petroleum projects; development and production of mines or oil wells could be visualized as a series of linked options. Various researchers have deepened in the field of real options, such as (Mascareñas Pérez-Iñigo *et al.* 2004, Aldanondo, Hadj-Hamou and Lamothe 2004, Bailey *et al.* 2002, Brach Marion 2003, Kulatilaka 1995, Mun 2010 and Mun 2002, among others.)

The origin of the theory of real options was the theory of financial options. Myron S. Scholes and Fisher Black (1973) were in the early 70's in the MIT Sloan School of Management with its famous Black and Scholes formula (1973, Nobel laureate in economics in 1997) for European options. An important contribution to this formula is by Robert C. Merton with his argument of not arbitrage. The transition from Capital Markets' theory to Corporate Finance's theory occurred in 1977, when Stewart C. Myers published his idea that a real option can be thought as a promising investment opportunity that can be experiment a wholly unforeseen event at valuation time, stemming from existing company's capabilities and its core competencies. It was not until 1996 when they held the first successful attempts to make the theory of real options accessible to financial practitioners, when Lenos Trigeorgis published his book Real Options. In his book, Trigeorgis (1998) explains various valuation methods and presents several case studies, where real options create value. Amram and Kulatilaka (1999) in turn presented the subject from a more practical point of view in his book, also called Real Options. Meanwhile, Copeland and Antikarov (2003) offered a less quantitative approach to applied real options. Trigeorgis (1993) and Chevalier-Roignant and Trigeorgis (2011) added game theory with ROV in their planning to help predict how competitors would play certain

strategies so companies be more flexible and know how to react. A good comparison of the variables used between the real options and financial options can be seen in Mascareñas (2004).

2.3. Net present value of a project that includes a real option

The use of real options in the valuation of investment projects, allows valuating flexibility or optionality that could have the project either: to extend, postpone, amend or abandon it at a future date. Flexibility in decisions, changes the traditional view of NPV, generating a modified, $\overline{\boldsymbol{NPV}}$, which is associated with the real option. The flexibility is expressed as follows:

$$\overline{NPV} = NPV + c$$

When applying the real option methodology to a project with $NPV < 0$, the project could be accepted if there is optionality to extend, postpone, amend or abandon it. This optionality in the future to take a new decision, has a present value associated, *c*, and even when $NPV < 0$, if $NPV + c > 0$, it would be feasible to extend, to delay, to contract, to abandon, etc., the project.

2.4. The option of postponing the project within a certain period

To evaluate a real option, Venegas and Fundia (2006), they assumed that a company must now decide whether to make a disbursement or postpone investment over a period of time, in this case the option to postpone the project is three years, on the assumption that if the investment is made, it would be irreversible, meaning that its recovery value is "0". The investment today would be represented by *K* at time $t = 0$, ifit is postponed until next year, it would be $t = 1$, and so on to subsequent years.

2.5. Different methodologies for options valuation

The best-known model for options valuation is the Cox-Ross-Rubinstein (1979), better known as binomial model for two, three or more time periods. More recently for multiple types of options, Boyle (1977) proposed the so called, Monte Carlo method, this method is very useful for the valuation of many kinds of real options, especially those that are more complex, because allows simulate a set of stochastic processes that describe economic and financial phenomena.

2.5.1. European call option, valuing three periods

The underlying cash flow is $CF_{r_{wacc}}$, the exercise price or delivery is K, and represents the investment in the project, the deadline is $T - t$, the time period is δt, the underlying asset value can increase from *CF* to *CFu*, or decrease from *CF* to *CFd*, with *0<d<1<u*. The parameters *u* and *d* obey the relationship:

$u = \frac{1}{d}$; where $u = e^{\sigma\sqrt{\delta t}}$ and σ is the volatility of returns produced by the expected cash flows of the investment project.

Then the binomial model is described to calculate the price of a buy option or call option, or simply a “call”. The expected cash flow value given market information at time t, is given by $E[CF \mid f_t] = CFe^{r\delta t}$, where δt is the time period considered and the risk free rate is $r$annualized rate; the probability that the cash flow goes up or down in the next period is given by $p = \frac{e^{r\delta t} - d}{u - d}$, the expected initial cash flow CF comes from future cash flows of income statement, discounted at WACC rate. With this information, is possible to construct the binomial tree of cash flow that includes their volatility. The values are calculated at each node from front to back, beginning in *t = 3* until *t = 0*. With *t = 3*, we have:

$f_{uuu} = \max\{CFuuu - K, 0\}$, $f_{ddd} = \max\{CFddd - K, 0\}$ and so on.

Then the present value of the European call option is given by: $f = e^{-r\delta t}[pf_u + (1 - p)f_d]$.

For a European put option their present value is calculated analogously to the previous one but it takes the expression: $\max\{-CFuuu + K, 0\}$.

2.5.2. American options: Call and put

On underlying cash flows is CF, the value of exercise is K it represents the investment in the project at any time, the deadline is $T - t$, the time period is δt, the underlying asset value can increase from *CF* to *CFu*, or decrease from *CF* to *CFd*, with *0<d<1<u*, the rate of risk free interest is r.

The present value of the American put option is given by:

$$f_{i,j} = \max\{e^{-r\delta t}[pf_{i+1,j+1} + (1-p)f_{i+1,j}], \qquad K - CFu^j d^{i-j}\}$$

With $0 \leq i \leq N-1$ y $0 \leq j \leq i$ and in which it has a probability p to move from the node (i,j) at time $i\delta t$ to the node $(i+1, j+1)$ at time $(i+1)\delta t$, and with probability $1-p$ to move from node (i,j) at time $i\delta t$ to the node $(i+1, j)$ at time $(i+1)\delta t$.

While the present value of American call option, is given by:

$$f_{i,j} = \max\{e^{-r\delta t}[pf_{i+1,j+1} + (1-p)f_{i+1,j}], CFu^j d^{i-j} - K\}.$$

2.5.3. Merton model on assets and real options

In 1973, Fisher Black and Myron Scholes published their article "The Pricing of Options and Corporate Liabilities" (1973). They developed a model for valuing a European option on a stock that does not pay dividends; the stock price is led by a geometric Brownian motion. However, the model was extended to non-financial assets that are not publicly traded, these are called real assets. Let CF the initial cash flow, K the project investment, r the risk-free rate, $T-t$ represents the contract term, σ the volatility of returns produced by the expected cash flows of the investment project. It is assumed that the cash flows are brought to present value at WACC rate, and are guided by a stochastic differential equation at time t, that follow a geometric Brownian process, and is given by:

$dCF_t = \mu CF_t dt + \sigma CF_t d\, W_t$, *where* μ is the average yield on cash flows.

The solution of last equation give us the cash flows at time t, that are presented by:

$$CF_T = CF_t e^{\left(r-\frac{1}{2}\sigma^2\right)(T-t)+\sigma\sqrt{T-t}\varepsilon}.$$

The European call option gives to the holder the right to invest in the project whose expected cash flows are discounted at WACC rate, given the market information at time *t* is:

$$C_{Call} = CF_t\Psi(d_1) - Ke^{-r(T-t)}\Psi(d_2).$$

In which,

$$d_1 = d_1(CF_t, t, T, K, r, \sigma) = \frac{ln\left(\frac{CF_t}{K}\right) + \left(r + \frac{1}{2}\sigma^2\right)(T-t)}{\sigma\sqrt{T-t}}; \qquad d_2 = d_1 - \sigma\sqrt{T-t}$$

and

$$\Psi(d) = P\{\varepsilon \leq d\} = \int_{-\infty}^{d} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}\epsilon^2}\, d\epsilon = 1 - \Psi(-d).$$

While the European put option that gives the right to sell the amount of the investment in the project, who's expected cash flows are discounted at WACC rate, is given by:

$$P_{Put} = Ke^{-r(T-t)}\Psi(-d_2) - CF_t\Psi(-d_1).$$

2.5.4. Fuzzy sets into binomial tree model

Professor Zadeh (1965) introduced the concept of fuzzy set, this allowing to the elements of a set take different grades of membership, which can be mapped into the interval [0,1], to unlike classical theory of sets, which considers the membership of elements of a set in absolute terms, that is in the set {0,1}.

The fuzzy model in discrete time is to adapt the traditional binomial model fuzzy logic; allowing operate and define the ambiguity of the underlying through triangular or trapezoidal fuzzy numbers, particularly in order to estimate movements upward or downward as described (Muzzioli and Torricelli 2004, Venegas-Martínez and Fundia 2006, Zdnek 2010, Liao and Ho 2010 and Milanesi 2014).

If we incorporate fuzzy sets into the traditional model of binomial tree, it allows us to define and operate properly ambiguity and uncertainty of cash flows, it can be done employing the function of triangular membership, thus makes possible to describe the moves upward or downward of cash flows, as described by Muzzioli and Torricelli (2004), Venegas-Martínez and Fundia (2006), Zdnek (2010), Liao and Ho (2010) and Milanesi (2014). A fuzzy number $A$is a set μ_A of the real line, convex and normalized such that $\exists x_0 \in R$ and is such that $\mu_A(x_0) = 1$

and μ_A continuous by pieces. Then all fuzzy number (fuzzy) is characterized by a membership function, μ_A: $R \rightarrow [0,1]$and all function as described, it produces a fuzzy number, where $x \in R$, and $\mu_A(x)$ is the degree of membership of$x$ for a fuzzy number A. The triangular membership function is given by:

$$\mu(x) = \begin{cases} 0 & if x \leq a, \\ \dfrac{x-a}{m-a} & if a < x \leq m, \\ \dfrac{b-x}{b-m} & if m < x \leq b \\ 0 & if x > b. \end{cases}$$

The fuzzy logic is incorporated in our evaluation study of the investment project. The advantage of the fuzzy theory applied in valuation models by means of real options is that it allows the possibility of capturing the bias in the function of probabilities distribution of the possible values of project. In this model, according to Milanesi (2014) and Liao and Ho (2010), values upward and downward are determined considering the volatility of returns of cash flows and its coefficient of variation *cv*, *i.*e.:

$$u = [u_1, u_2, u_3] = \left[\exp\left((1-cv)\sigma\sqrt{\delta t}\right), \exp\left(\sigma\sqrt{\delta t}\right), \exp\left((1+cv)\sigma\sqrt{\delta t}\right)\right].$$

$$d = [d_1, d_2, d_3] = \left[\frac{1}{u_1}, \frac{1}{u_2}, \frac{1}{u_3}\right].$$

The odds upward and downward are given by:

$$P_u = \left[P_{u_1}, P_{u_2}, P_{u_3}\right] = \left[\frac{e^{r\delta t} - d_1}{u_1 - d_1}, \frac{e^{r\delta t} - d_2}{u_2 - d_2}, \frac{e^{r\delta t} - d_3}{u_3 - d_3}\right].$$

$$P_d = 1 - P_u$$

The sum of cash flows discounted at the WACC rate are determined by:

$$PVCF_{n-t} = \sum_{t=0}^{n} \frac{CF_{n-t}}{(1 + r_{WACC})^n}.$$

To apply the diffuse binomial model (Milanesi 2014), it requires estimation three grids (or binomial trees), *i.e.:*

1. The 1st fuzzy binomial grid corresponds to the performance of the underlying. To do this, it is considered the ratio of cash flows to present value of project:

$RF_t = \frac{FE_t}{PVCF_t}$ where as the underlying can be increased by the amount:

$u = [u_1, u_2, u_3]$ or decreased by the amount $d = [d_1, d_2, d_3]$, and where such magnitude is discounted from their projected fuzzy value.

Therefore, these cash flows are presented in the binomial tree, considering the next equation:

$$RF_{(i,j)t} = RF_{(i,j)t}u\left(1 - RF_{t-j}\right) or RF_{(i,j)t} = RF_{(i,j)t}d\left(1 - RF_{t-j}\right) conj \geq 1. \quad (1)$$

2. In the 2nd fuzzy binomial grid projection fuzzy cash flows are calculated by incorporating the value of $RF_{(i,j)t}$ in each node, *i.e.:*

$$RF_{(i,j)t}{}' = RF_{(i,j)t}(u)RF_t or RF_{(i,j)t}{}' = RF_{(i,j)t}(d)RF_t. \quad (2)$$

3. The 3rd fuzzy binomial grid is calculated from the above grids and taking into account equivalently to the assumptions of American call option. For this reason, to build the fuzzy binomial tree of American call option (in fact a real option), with its corresponding probabilities, the values of nodes are given by:

$$VOBc_{(i,j)t} = \max\{RF_{(i,j)t}(u)RF_t + e^{-r\delta t}\left[VOB_{(i,j)t+1\ alza}{}' P_{u_k} + VOB_{(i,j)t+1\ baja}{}' P_{dm}\right], \\ RF_{(i,j)t}(d)RF_t + e^{-r\delta t}\left[VOB_{(i,j)t+1\ alza}{}' P_{u_k} + VOB_{(i,j)t+1\ baja}{}' P_{dm}\right]\} \quad (3)$$

With $i = 1, k = 3, m = 1;\ i = 2, k = 2, m = 2;\ i = 3, k = 1, m = 3.$

To determine the positive bias (to the right), it is considered $\lambda = AD/(AI + AD)$, where AD is the area of the triangle to the right of VOB_{base} and AI is the area of the left triangle that capturing the negative bias. The λ factor represent optimistic-pessimistic index is known by Yoshida *et al.* 2006. Then the expected value of the American option with fuzzy logic. Based on the defuzzification algorithm in which the expectation value is calculated by centroid function method (Zadeh 1965, Tucha and Brem 2006, Yu, Shouyang and Keung Lai 2009) we have:

$$\text{Centroid} = E[x] = \frac{\sum_{i=1}^{n} x_i f(x_i)}{\sum_{i=1}^{n} f(x_i)}.$$

Applied in this case, with:

$f(x_1) = (1-\lambda), f(x_2) = 1, f(x_3) = \lambda,$ and

$x_1 = \text{VOB}_{min}, x_2 = \text{VOB}_{base}, x_3 = \text{VOB}_{max}$.

The expectation value is:

$$E[VOBc] = \frac{(1-\lambda)\text{VOB}_{min} + \text{VOB}_{base} + \lambda\text{VOB}_{max}}{(1-\lambda) + 1 + \lambda} = \frac{(1-\lambda)\text{VOB}_{min} + \text{VOB}_{base} + \lambda\text{VOB}_{max}}{2}. \quad (4)$$

3. Results and discussion

The results are described following four methods: Deterministic Net Present Value, European call option by Black & Scholes valuation, Real American call option by Binomial trees and finally the incorporation of fuzzy logic analysis in the Real American call option. The results of first three methods are included in Table 1. In the next paragraphs the fuzzy logic analysis is described.

Table 1 - The value of NPV, Put and Call options with conventional methods

Original (initial) Project investment building CEDI	Net Present Value of project	WACC	Total Present Value of the expected cash flows of postponed project, CF	Investment value updated to 3 years 91 day CETES[13], K
$58.514.581,00	$6.203.373,00	7,35%	$64.717.954,00	$64.126.877,00
Black-Scholes model	Call	% of investment	Put	% of investment
	$18.322.418,00	28,57	$12.036.457,97	18,77
Binomial Trees with volatility:				
European	$19.473.463,84	30,37	13.187.503,82	20,56
American	$19.473.463,84	30,37	13.734.820,34	21,42

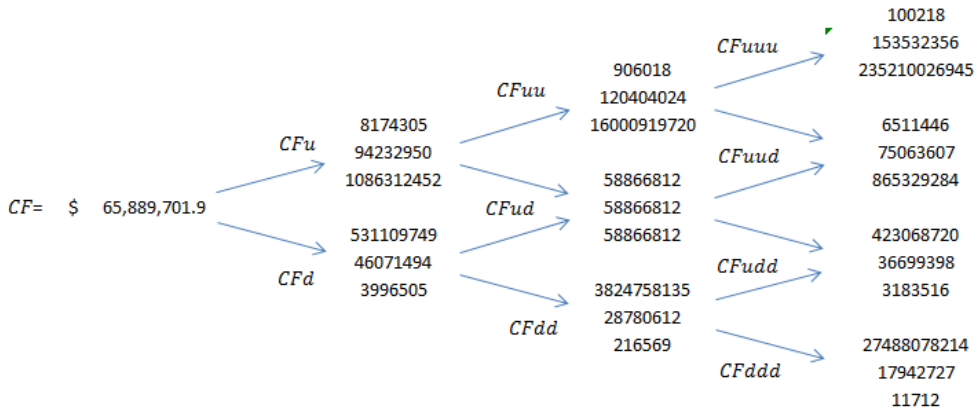
Source: Own author[14]. Amounts are expressed in Mexican pesos.

3.1. Calculation of first fuzzy binomial grid

For the first fuzzy binomial grid the cash flows are presented in a three-year period considering $u = [u_1, u_2, u_3]$ and $d = [d_1, d_2, d_3]$. These cash flows are presented in the binomial tree considering the equation (1). The use of this technic incorporates intrinsically continuous probability variations associated with each component in the process, when we use the algorithm described we adapt the solution more in keeping with the dynamics of projected cash flows.

[13] CETES-91 is Treasury bond of Mexican government, with a maturity of 91 days.

[14] In this case and in all the next tables and figures, the used data are an estimation of real data, according to the request of the company responsible for the project.



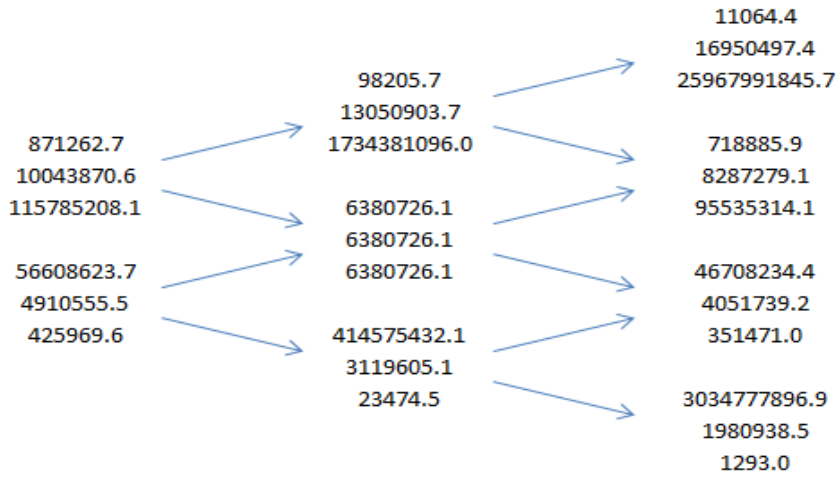
Source: Own author

Figure 1 - Binomial tree of the projected cash flows for three years

3.2. In the second fuzzy binomial grid projection fuzzy cash

For the second fuzzy binomial grid projection, fuzzy cash flows is calculated by incorporating the value of $RF_{(i,j)t}$ and use the equation (2).

In this grid, the evolution of cash flows for each period based on the cash flows of the underlying value is presented, *i.e.* the projection of fuzzy cash flows is given by:

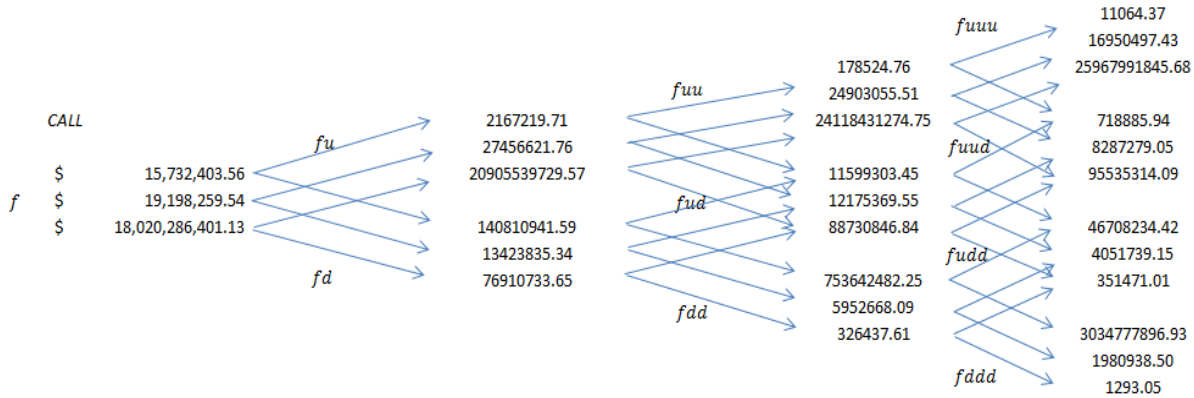


Source: Own author

Figure 2 - Projection of fuzzy cash flows

3.3. The expected values of the American option with fuzzy logic

Considering the equation (3), the value of the real option in each period is presented in the Figure 3.



Source: Own author

Figure 3 - The values of the Calls of real option

The expected values of the American option with fuzzy logic are shown in Tables 2 and Table 3.

Table 2 - Calculation of u's, d's, Pu's and Pd's, by means of fuzzy analysis

CF_rwacc	Investment, K	?	r	C.V.
$65.889.701,88	$64.126.877,34	0,357787743	3,10%	6,83
Parameters in the binomial model fuzzy				
The upward	u1	0,1241	Pu1	0,8857
	u2	1,4302	Pu2	0,4546
	u3	16,4868	Pu3	0,0591
The downward	d1	8,0606	Pd1	0,1143
	d2	0,6992	Pd2	0,5454
	d3	0,0607	Pd3	0,9409

Source: Own author. Amounts are expressed in Mexican pesos.

Table 3 - The expected value of the American option with fuzzy logic

Binomial trees and Fuzzy logic:				
VOB_{min}	$15,732,403.56			
VOB_{base}	$19,198,259.54			
VOB_{max}	$18,020,286,401.13			
$BASE1=VOB_{base}-VOB_{min}$	$3,465,855.98	$BASE2=VOB_{max}-VOB_{min}$	$18,001,088,141.59	
	Positive bias Pessimist-optimist index	Negative bias Pessimist-optimist index	Experts	Setting
LAMBDA	0,999808	0,000192	0,60	0,67
1-LAMBDA	0,000192	0,999808	0,40	0,33
Applied equation (4)				
Fuzzy expected value option	$9,018,009,402.35	$19.198.259,54	$20.584.601,93	$20.931.187,53
	14.063,73%	29,94%	32,10%	32,64%
	Non-feasible	Feasible	Feasible	Feasible

Source: Own author. Amounts are expressed in Mexican pesos.

The value of the Real American call option obtained by fuzzy logic 29.94%, is the best price for the premium value of the planned investment in the project, it represents an intermediate value compared to the values obtained with conventional methods: 28.57% using Black Scholes and 30.37% with binomial trees; such that allows continuous variation of parameters, thus generating a family of values that fits the real value in the development project of the extension of an auxiliary rail freight terminal. We can see in the table also, the first value which by its dimension is completely unfeasible, as would represent 14,063.73% of the project cost.

Conclusions

The results obtained in the prices of real options allows a deep analysis over the flexibility and advantages that the investor faces in the project development for the extension of an auxiliary rail freight terminal to integrate it into a logistics platform, and in that the first phase of the overall project consists of the construction of a Distribution Centre (CEDI), with the purpose of offering new logistics services. It is evaluated the development of the project from the perspective of postponing its construction over a period of three years or have the flexibility of wait less time according to economic-financial and political environment. For this reason, it is very necessary, wait for the results of the study by the National System of Logistical Platforms and the guidelines and the public policy, that they could dictate by Authority in the matter over the sense of promoting and give competitive advantages for development; and moreover, wait for a rebound in economic activity and its environment, trying to reduce the risk to a minimum and avoid exposing the company to adverse changes in the value of assets and their expected benefit.

It should be noted that the averaging period to three years was based according to the failures of structural reforms of the current presidential term, this due to the impact of exogenous events such as the reduction in international oil prices and that it has a direct impact on the federal budget by reducing expenditures budget of federal government involving the cancellation and postponement of projects hence the possibility of providing investors the opportunity to realize the project before the deadline *T-t*. It is for this reason, that in a world of risk and of uncertainty, it becomes prudent assessment of the options that could lead to the project, as part of a strategic planning that affects beneficially for the company, and minimizing the risk the optimum way.

The results show that the volatility is $\sigma = 35.78\%$ of the yields of the cash flows, this value is significant in the valuation process of investment project, the value of the investment in the project is $ 64,126,877 and present value of expected cash flows is $ 64,717,954 it is discounted at weighted average cost of capital of 7.35%. Therefore, for that the investment project is feasible, the present value of expected cash flows discounted at r_{WACC}rate, should be greater than initial investment to keeping alive the investment option, in this case results that NPV is positive, it means the investment is accepted. However, the investors don't have flexibility in their decision making

Comparing the prices obtained of the real option shows: From the model of Black and Scholes, it is observed that the price of the option is $18,322,418, equal to 28.57% of the initial investment outlay at the time of expiration, which implies three years of postponement. While the price obtained for the American call option, has a percentage of 30.37% of the current investment; it shows to the investors, how much it would cost to have the right to postpone the project three years and to have the possibility of beginning the project in any moment into this period if the economic-financial and political environment is feasible.

The use of fuzzy logic allows us to estimate the expected value of the American call option, in which has been considered a distribution function of triangular way, as well as a minimum value of the option, one maximum and another, base value, which incorporate volatility of the cash flows and incorporates the coefficient of variation unlike only the minimum and maximum values. This involves having a payment on the option premium of 29.94% of the value of the investment in the project if it is postponed until three years, as recommended by the experts in this type of projects and with the possibility to exercise at any time of period considered and giving the investor the flexibility to exercise according to the financial-economic environment, what represent a great advantage for the investor. This kind of evaluation allows the membership relation of an element of a set, change gradually and no in discrete and absolute way as the classical theory of sets, ie, admitting valued belongings in the range [0,1] instead of the set {0 ,1}.

In turbulent and uncertain environments is need, search the methodologies which enable to evaluate projects, incorporating the benefits of new opportunities or investment strategies and to mitigate the risk inherent in them. Fuzzy logic offers investors a more sophisticated and robust approach that helps them to support the results obtained. Moreover, facing the challenge of infrastructure financing in the current economic scenario, this technique applied to the valuation of socio-economic projects related to infrastructure development, especially in the communications and transport sectors, which requires multimillion-dollar investments, is very useful, it shows the investment alternatives pattern to the authorities responsible for their evaluation and acceptance that accommodate new valuation techniques, giving them a more accurate and precise way in measuring uncertainty and risk approach; the ability to break down large projects into sub-projects; assess the overall risk of a project and its sub-projects; the possibility to postpone, to stop and reactivate a project; know beforehand extreme scenarios such as the abandonment of a project; contemplate accepting projects that at first glance can be discarded by having a negative net present value close to cero. This type of innovation in the sector can accommodate greater participation of the private sector, by leveraging schemes such as public-private partnership, providing more benefits at private investor's and greater certainty to the public sector and enabling it to reach its socio-economic objectives. All this, if projects are observed under the new optical: valuation of real options with fuzzy logic.

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Economic and Mathematical Modeling of Complex Cooperation of Academic Staff of Educational Cluster on the Basis of Fuzzy Sets Theory

Evgeniy N. TISHCHENKO
Rostov State University of Economics[15] (RINH), Russia
celt@inbox.ru

Tatyana N. SHARYPOVA
North-Caucasian Branch of Moscow
Technical University of Communications and Informatics[16], Russia
tnt72@mail.ru

Elena V. ZHILINA
IT and Information Protection
Rostov State University of Economics (RINH), Russia
black-2@mail.ru

Saveliy E. CHERKEZOV
IT and Information Protection
Rostov State University of Economics (RINH), Russia
saveliy@gmail.com

Abstract

The article substantiates necessity for development of fuzzy models for evaluation of cooperation level of academic staff of educational cluster on the basis of fuzzy sets theory, which allow performing integral accounting of qualitative input/output parameters. Methodology of complex of fuzzy models is brought down to analysis of problem situation and structuring of subject sphere, development of fuzzy models, execution of calculation experiments with fuzzy model, application of results of calculation experiments, and correction of fuzzy model. The authors develop a complex of fuzzy models for evaluation of cooperation level of academic staff of educational cluster, which includes the following models in the basis of fuzzy sets theory: model of evaluation of cooperation of academic staff of university chair, which is a part of a cluster; model of evaluation of post-graduate system of professional training for academic staff of cluster; model of evaluation of developed strategy of cooperation of academic staff of cluster; model of evaluation of cooperation of cluster multiplier; model of evaluation of development of mobile innovational group of cluster; model of formation of linguistic evaluation of students' success in studying; model of evaluation of use of cluster web-resources. Modeling is realized by means of MATLAB with the use of specialized package Fuzzy Logic Toolbox on the basis of fuzzy inference of the Mamdani algorithm.

Keywords: fuzzy model, educational cluster, Mamdani algorithm, linguistic variable, MATLAB, membership function.

JEL Classification: C31

1. Introduction and overview

Significant peculiarity of higher education is complexity of qualitative evaluation of cooperation of academic staff of universities which belong to a cluster. There is not unified list of indicators of cooperation quality, as there is no idea which quantitatively measured factors influence it, in which evaluating indicators it is expressed, and what is authenticity of these indicators.

It is obvious that during formation of rating scale of the used parameters of a model, role of subjectivism is very large – as here a lot depends on experience, intuition, competence, and experts' professionalism. Besides, requirements, set by various experts to the level of cooperation of academic staff of a certain educational cluster differ greatly.

During formation of results scale, the method of "trials and errors" is frequently met (Khubaev 1996). Fuzziness of such notion does not allow old methods of mathematical modeling to receive adequate quantitative descriptions of studied parameters, so it is necessary to solve classic tasks of educational process with non-classic methods.

[15] 69 Bolshaya Sadovaya St., Rostov-on-Don, Russia
[16] 62 Serafimovicha St., Rostov-on-Don, Russia, 344002

The most interesting feature of human intellect is capability to make right decisions with incomplete and fuzzy information. Development of models of approximate discussions of human and use of them in computer systems of future generations is one of the most important problems of science (Kruglov *et al*. 2001).

Substantial progress in this regard is made by Professor of the California University (Berkeley) Lotfi, A. Zadeh. How work "FuzzySets", which appeared in 1965 in the journal "Information and Control" (No. 8), set foundations of modeling of intellectual activities of human and was a start for development of a new mathematical theory. Zadeh expanded classic notion of set, assuming that characteristic function (function of belonging of element to set) can take any values in the interval [0; 1], and not only values 0 or 1. Such sets were named fuzzy.

Having introduced the notion linguistic variable and assuming that its terms are fuzzy sets, L. Zadeh created apparatus for description of the processes of intellectual activities, including fuzziness and uncertainty of expressions. Actuality of this problematics is emphasized by large number of works by Russian (Olishevskiy and Serbinovskiy 2009, Tishchenkoand and Zhilina 2015) and foreign scientists (Wang 1992, Weiss 1973), devoted to it.

Methodology of fuzzy modeling does not replace or exclude methodology of systemic modeling, but specifies the latter as to the process of building and use of fuzzy models of complex systems. The process of fuzzy modeling is the similar consequence of interconnected stages as the process of system modeling. At that, each stage is performed for the purpose of building and use of fuzzy model of the system for solving the initial problem. Generally, fuzzy model is understood as informational and logical model of the system built on the basis of fuzzy sets and fuzzy logics theory. Use of fuzzy models for calculation of quantitative indicators of cooperation of university academic staff will expand possibility for use of clusters in higher education and will allow evaluating output parameters of models under the conditions of uncertainty and lack of statistical data.

Methodology

Methodology supposes common approach to complex cooperation of university academic staff on the bases of cluster, which realizes the program within the sphere of informational security.

Proprietary methodology is supposed to help solving the main issue: with the help of which scientific methods and means of cognition, university academic staff must achieve real cooperation of subjects and their further cooperation. Principles of spatial cooperation of university academic staff on the basis of cluster are a very important aspect in optimization of expenditures of the whole cluster.

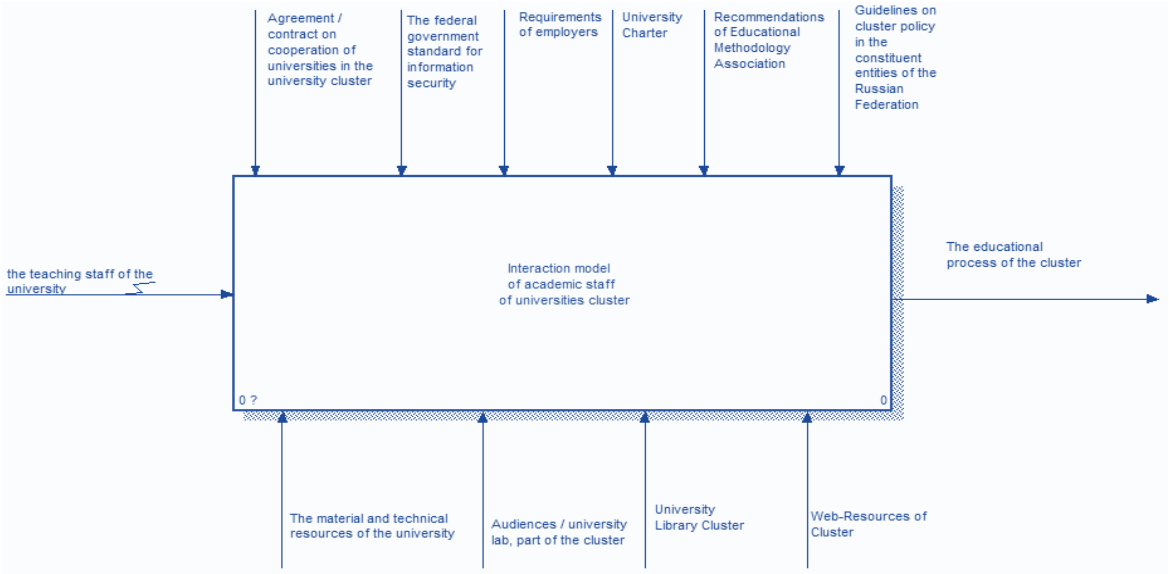
The methodology is brought down to consecutive solution of the following tasks:

- analysis of problem situation and structuring of subject sphere;
- building fuzzy models;
- execution of calculation experiments with a fuzzy model;
- use of results of calculation experiments;
- correction or development of fuzzy model.

Analysis of methodological recommendations on realization of cluster policy in subjects of the Russian Federation, existing experience of cluster organization (Tishchenko and Zhilina 2015), and other normative documents (recommendations of the Academic Methodological Association for distribution of competences, recommendations of the AMA for use of library fund, recommendations of the AMA for use of material and technical resources), and requirements of partners-developers allowed formulating the structure of functional model and distinguishing informational flows of cooperation of university academic staff which are part of cluster of educational program in the sphere of informational security.

For description of performed functions and analysis of processes of cooperation of academic staff, structural and functional model (AS-TOBE model) was developed in notation IDEF0 (hierarchical diagram systems were built).

Figure 1 shows context diagram of the model with management objects (agreements, requirements, statute, recommendations), incoming flows (university academic staff), mechanisms (material and technical resources, library fund, lecture halls, laboratories, web resources of cluster), aimed at receipt of efficient information: optimization of educational process of cluster, which realizes program in the sphere of informational security.

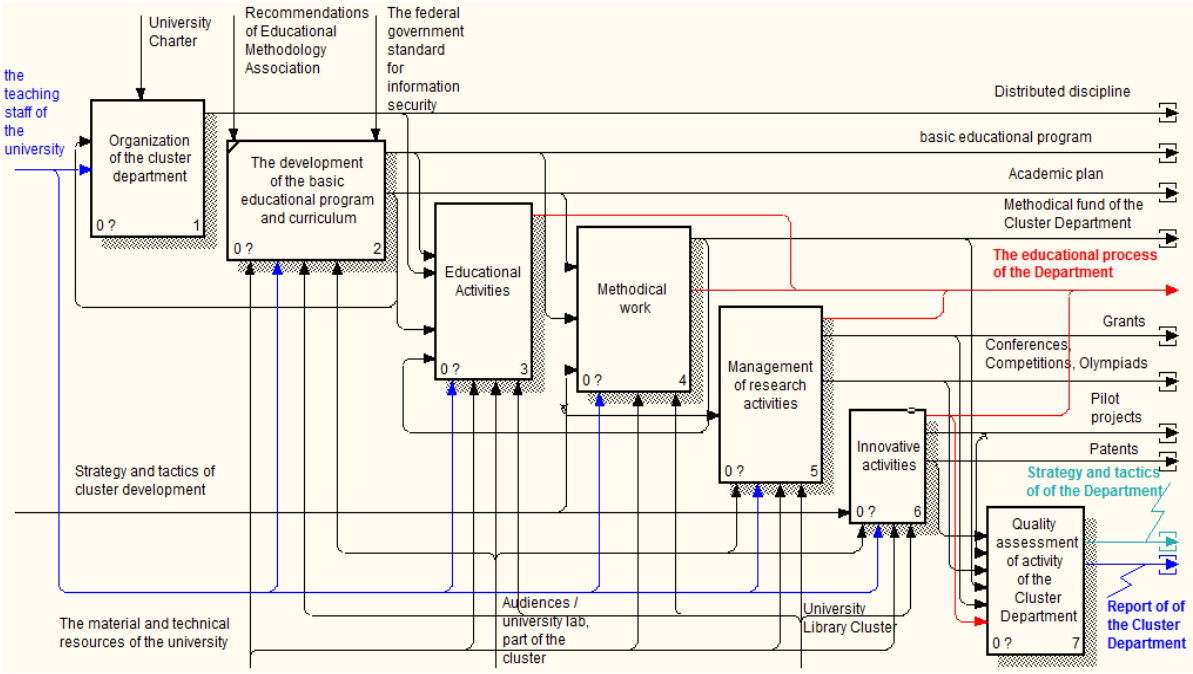


Source: developed by the authors with CASE – tool BPWin

Figure 1 - Context diagram of structural and functional model of the process of cooperation of academic staff of educational cluster

As a result of decomposition of context diagram, detailed model in notation IDEF0 was received, Figure 2, which includes all processes of cooperation of academic staff of cluster of informational security program:

- cooperation of academic staff of university chair, which is a part of cluster;
- advanced training of academic staff cluster;
- work of project group of university academic staff, which is a part of cluster;
- work of multipliers of cluster academic staff;
- work of mobile innovational group of cluster of program in the sphere of informational security;
- use of special web-resources (systems) of educational cluster.



Source: developed by the authors with CASE–tool BPWin

Figure 2 - Diagram of decomposition of the higher level of visual model of cooperation of academic staff of the cluster, notation DEF0

At this stage, it is possible to see tunnel informational flows which influence achievement of common goal of cooperation of academic staff of cluster: educational process of chair, increased qualification (competence) of

lecturer in a cluster, strategy and tactics of cluster development, educational process, cluster of chair of the program in the sphere of informational security, project group.

Development of fuzzy models for calculation of quantitative indicators of cooperation of university academic staff of a cluster is brought down to building a complex of models which consists of 1st level models, output parameters of which are input parameters for realization of 2nd level model.

Fuzzy modeling of the analyzed subject sphere was conducted by the authors with the use of specialized package Fuzzy Logic Toolbox of MATLAB. Execution of fuzzy inference was realized on the basis of the Mamdani algorithm.

Development of 1st level models

Mathematical model (1) of evaluation of cooperation of academic staff of the chair of university of a cluster could be presented in the general form:

$$x_{1i} \rightarrow LR1 \rightarrow \text{Str/Tkt\_kaf}, \quad (1)$$

where: Str/Tkt_kaf – strategy/tactics of the chair; x_{1i} – incoming variables of first model, $i \in [1,6]$; x_{11} – methodical funds of the chair (Fond_kaf); x_{12} – grants (Grant); x_{13} – conferences, competitions, academic competitions (Konf); x_{14} – innovations (Innov), x_{15} – educational process of the chair (YP), x_{16} – activities of the chair during the studied period (Rez_kaf). RD1 is rule database, necessary for formation of evaluation of strategy/tactics of current development of the chair.

Each of linguistic incoming variables has triangular membership functions, which could be expressed in the following way (Kruglov 2001).

$$\mu_{\Delta}^{j}(xi,a,b,c) = \begin{cases} 0, & x \le a, \\ \dfrac{x-a}{b-a}, & a \le x < b, \\ \dfrac{c-x}{c-b}, & b \le x \le c, \\ 0, & c \le x \end{cases}, \quad (2)$$

where: a, b, c – certain numerical parameters which characterize foundation of triangle (a, c) and its top (b) – the following condition should be observed: $a \le b \le c$.

Variable «Fond_kaf» (Chair fund) consists of three term-sets, determined at the interval [0,1]: “fully sufficient” [0.6, 1], “sufficient” [0.1, 0.9], “insufficient” [0, 0.4], which determines the level of availability of scientific and methodological literature in the sphere of informational security.

Variable “Grant” consists of three term-sets, determined at the interval [0,1]: “low level” [0, 0.4], “medium level” [0.10, 0.90], “high level” [0.60, 1], which determined quantity and quality of received grants and their realization over the studied period.

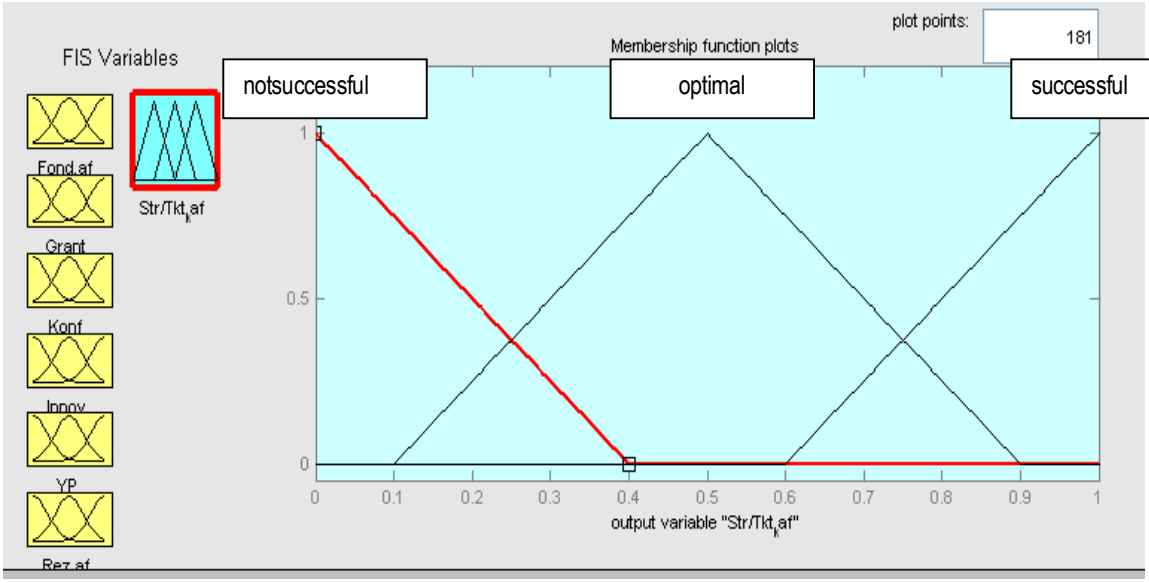
Structure of term-sets of linguistic variable “Konf” (conferences) is brought down to terms: “low approbation” [0, 0.4], “medium approbation” [0.10, 0.90], and “high approbation” [0.60, 1], which allows evaluating quality and quantity of articles and theses of academic staff and students and participation in academic contests by students of cluster program.

Variable “Innov” (Innovations) consists of three main term-sets, determined at the interval [0,1]: “low level” [0, 0.4], “medium level” [0.1, 0.9], “high level” [0.60, 1], which reflect quality and quantity of the used implemented innovations and realized pilot projects, including patents, new software products, network academies, network resources, etc.

Variable “YP” (Educational process of the chair) consists of four term-sets, determined at the interval [0,1]: “unsatisfactory” [0, 0.2], “satisfactory” [0.1, 0.5], “good” [0.4, 0.9], “excellent” [0.7, 1], which determined the level of proficiency of students who study by educational program of cluster.

Variable «Rez_kaf» (Activities of chair during the studied period) consists of three main term-sets determined at the interval [0, 1]: “low results” [0, 0.4], “medium results” [0.1, 0.9], “high results” [0.60, 1] and two additional term sets: “results below medium” [0, 0.5], “results above medium” [0.5, 1].

Figure 3 shows graph of functions of belonging of fuzzy term-sets of linguistic variable «Str/Tkt_kaf» (Strategy/Tactics of chair), set in MATLAB, which corresponds to output 1 model.



Source: developed by the authors with Fuzzy Logic Toolbox

Figure 3 - Formation of outgoing linguistic variable "Str/Tkt_kl"

With membership function of fuzzy term-sets, linguistic variable "Str/Tkt" will have the following form: $\mu^{H}_{\text{Str/Tkt\_kaf}}$ (x, 0, 0, 0.4); $\mu^{O}_{\text{Str/Tkt\_kaf}}$ (x, 0.1 , 0.5, 0.9); $\mu^{Y}_{\text{Str/Tkt\_kaf}}$ (x, 0.6, 1, 1).

Mathematical model of evaluation of developed strategy of cooperation of academic staff of cluster could be presented in the following way (3):

$$x_{2i} \rightarrow LR2 \rightarrow \text{Str/Tkt\_kl}, \tag{3}$$

where: Str/Tkt_kl – strategy/tactics of cluster; x_{2i} – incoming variables of second model, $i \in [1,4]$; x_{21} – knowledge-skills-arts (Z-N-Y); x_{22} – ranking of academic staff of the chair (Reit_kaf); x_{23} – ranking of academic staff of cluster (Reit_klastera); x_{24} – activities of cluster over the studied period (Rez_klastera). RD2 is rule database, necessary for formation of evaluation of strategy/tactics of current development of cluster.

Variable "Z-N-Y" (Knowledge-skills-arts) consists of three term-sets determined at the interval [0,1] with triangular membership function: "correspond" [0.6, 1], "insufficiently correspond" [0.1, 0.9], "do not correspond" [0, 0.4], which determines the level of knowledge-skills-arts with students who have undertaken studies by the program (cycle) in the sphere of informational security.

Variable "Reit_kaf" (Rankings of the chair) consists of three term-sets, determined at the interval [0,100]: "low" [0, 40], "medium" [10, 90], "high" [60, 100]. Same terms are peculiar for variable "Reit_klastera" (Cluster ranking).

Variable "Rez_klastera" (Cluster result) consists also of three main term-sets, determined at the interval [0,1]: "low" [0, 0.4], "medium" [0.1, 0.9], "high" [0.60, 1] and two additionally introduced term-sets: "below medium" [0, 0.5], "above medium" [0.5, 1].

Graph of membership functions of fuzzy term sets of linguistic variable "Str/Tkt_kl" (Strategy/Tactics of cluster) is similar to Fig. 3. With membership function of fuzzy term sets, linguistic variable "Str/Tkt" will have the following form:

$$\mu^{H}_{\text{Str/Tkt\_kl}}(x, 0, 0, 0.4);\ \mu^{O}_{\text{Str/Tkt\_kl}}(x, 0.1, 0.5, 0.9);\ \mu^{Y}_{\text{Str/Tkt\_kl}}(x, 0.6, 1, 1).$$

Mathematical model of evaluation of post-graduate system of professional training of academic staff of cluster could be presented in the following form (4):

$$x_{3i} \rightarrow RD3 \rightarrow \text{SPrPodg}, \tag{4}$$

where: SPrPodg – system of professional training of academic staff of cluster; x_{3i} – incoming variables of third model, $i \in [1,4]$; x_{31} – diplomas (certificates) of additional training (D); x_{32} – plan of cluster for additional training (Plan_klastera); x_{33} – plan of the chair of additional training (Plan_ kaf); x_{34} – results of additional

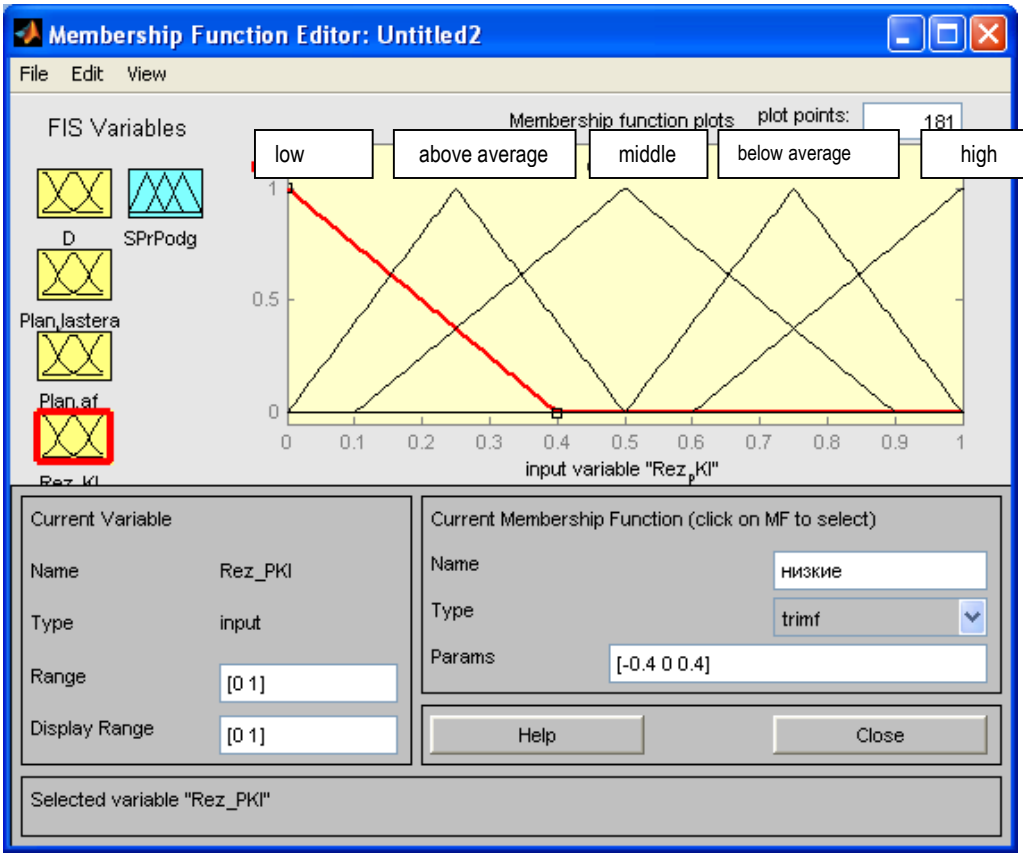
training for the studied period (Rez_PKI). RD3 is rule database, necessary for formation of evaluation of post-graduate system of professional training of academic staff of cluster.

Each of linguistic incoming/outcoming variables of the model of evaluation of post-graduate system of professional training of academic staff of cluster has triangular membership functions (2).

Variable "D" (diplomas (certificates) of additional training) consists of three term-sets determined at the interval [0,1]: "do not require additional training" [0.6, 1], "correspond sufficiently" [0.1, 0.9], "require additional training" [0, 0.4], which determines the level of competence with academic staff of cluster in the sphere of informational security.

Variable "Plan_klastera" (Plan of cluster of additional training) consists of three term-sets, determined at the interval [0,1]: "low" [0, 04], "medium" [0.10, 0.90], "high" [0.60, 1]. The same terms are peculiar for Variable «Plan_ kaf» (plan of the chair of additional training).

Variable "Rez_PKI" (results of additional training during studied period) consists of three main term sets determined at the interval [0,1]: "low" [0, 0.4], "medium" [0.1, 0.9], "high" [0.60, 1] and two additionally introduced term sets: "below medium" [0, 0.5], "above medium" [0.5, 1], Figure 4.



Source: developed by the authors with Fuzzy Logic Toolbox

Figure 4 - Formation of incoming linguistic variable "Rez_PKI" ("Results of increase of qualification for the studied period")

Graph of membership functions of fuzzy term-sets of linguistic variable "SPrPodg" (system of professional training of academic staff of cluster), output 1 in the model, is similar to Figure 3. With membership function of fuzzy term-sets, linguistic variable "SPrPodg" will have the following form: μ^{H}_{SPrPodg}(x, 0, 0, 0.4); $\mu^{O}_{\text{SPrPodgl}}$(x, 0.1, 0.5, 0.9); μ^{y}_{SPrPodg}(x, 0.6, 1, 1).

Mathematical model of cooperation of multipliers of cluster could be presented in the following way (5):

$$x_{4i} \rightarrow RD4 \rightarrow \text{Str/Tkt\_mult}, \quad (5)$$

where Str/Tkt_mult– strategy/tactics of multipliers of cluster; x_{4i} – incoming variablesof fourth model, $i \in [1,5]$; x_{41} – methodical fund of multipliers of cluster (Fond_mult); x_{42} – grant of multipliers of cluster (Grant_mult); x_{43}

– innovations (Innov_mult), x_{44} – studying process of multipliers of cluster (YP_mult), x_{45} – activities of multipliers ofcluster over the studied period (Rez_mult). RD4 is rule database, necessary for formation of evaluation of strategy/tactics of current development of multipliers of cluster.

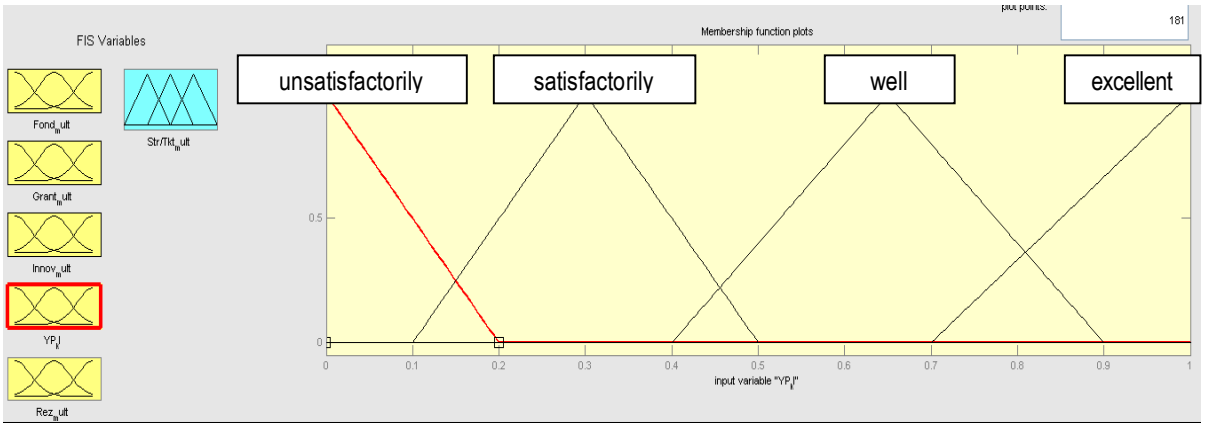
Each of linguistic incoming variables of the model has triangle membership functions (2).

Variable «Fond_mult» (Methodical fund of multipliers of cluster) consists of three term-sets determined at the interval [0,1]: “all-sufficient” [0.6, 1], “sufficient” [0.1, 0.9], “insufficient” [0, 0.4], which determined the level of availability of scientific literature of multipliers of cluster.

Variable “Grant_mult” (Grants of multipliers of cluster) consists of three term-sets, determined at the interval [0,1]: “low level” [0, 0.4], “medium level” [0.10, 0.90], “high level” [0.60, 1] (Figure 4), which determined quantity and quality of received grants by multipliers of cluster and their realization for the studied period.

Variable “Innov_mult” (Innovations) consists of three main term-sets, determined at the interval [0,1]: “low level” [0, 0.4], “medium level” [0.1, 0.9], “high level” [0.60, 1], which reflect quality and quantity of used and implemented innovations and realized pilot projects, including patents, new software, network academies, network resources, etc.

Variable “YP_mult” (Studying process of multipliers of cluster) consists of four term-sets, determined at the interval [0,1]: “unsatisfactory” [0, 0.2], “satisfactory” [0.1, 0.5], “good” [0.4, 0.9], “excellent” [0.7, 1], which determined the level of provision of students of cluster multiplier (Figure 5).



Source: developed by the authors with Fuzzy Logic Toolbox

Figure 5 - Formation of incoming linguistic variable “YP_kl” (“Teaching process of cluster’s multipliers”)

Variable “Rez_kaf” (Activities of the chair for the studied period) consists of three main term-sets, determined at the interval [0,1]: “low results” [0, 0.4], “medium results” [0.1, 0.9], “high results” [0.60, 1] and two additionally introduced term-sets: “results below medium” [0, 0.5], “results above medium” [0.5, 1].

Graph of membership functions of fuzzy term-sets of linguistic variable “Str/Tkt_mult” (Strategy/Tactics of multipliers) is same as Fig. 3. With membership function of fuzzy term-sets, linguistic variable “Str/Tkt_mult” will have the following form: $\mu^{H}_{\text{Str/Tkt\_mult}}$(x, 0, 0, 0.4); $\mu^{O}_{\text{Str/Tktmult}}$ (x, 0.1, 0.5, 0.9); $\mu^{Y}_{\text{Str/Tkt\_mult}}$(x, 0.6, 1, 1).

Mathematical evaluation of development of mobile innovational group of cluster of the program in the sphere of informational security could be presented in the following way (6):

$$x_{5i} \rightarrow RD5 \rightarrow \text{Str/Tkt\_mob}, \quad (6)$$

where: Str/Tkt_mob– strategy/tactics of development of mobile innovational group of cluster; x_{5i} – incoming variables of fifth model, $i \in [1,6]$; x_{51} – methodical fund of mobile innovational group of cluster (Fond_mob); x_{52} – grants of mobile innovational group of cluster (Grant_mob); x_{53} – conferences, academic contests (Konf_mob); x_{54} – innovations (Innov_mob), x_{55} – studying process of cluster (YP_kl), x_{56} – activities of mobile innovational group of cluster for the studied period (Rez_mob).RD5 is rule database, necessary for formation of evaluation of strategy/tactics of current development of mobile innovational group cluster.

Formation of incoming linguistic variable “Fond_mob” (x_{51}) is same to formation of incoming linguistic variable “Fond_mult” (x_{41}). Formation of incoming linguistic variable “Grant_mob” (x_{52}) is same to formation of incoming linguistic variable “Grant_mult” (x_{42}).

Structure of term-sets of linguistic variable “Konf_mob” (Conferences, academic contests) is brought down

to: "low approbation" [0, 0.4], "medium approbation" [0.10, 0.90], "high approbation" [0.60, 1], which allows evaluating quality and quantity of articles and theses of academic staff and students and participation in competitions and academic contests by students of cluster program.

Formation of incoming linguistic variable "Innov_mob" (x_{54}) is same to formation of incoming linguistic variable "Innov_mob" (x_{43}). Formation of incoming linguistic variable "YP_kl" (x_{55}) is same to formation of incoming linguistic variable "YP_kl" (x_{44}).

Variable «YP_kl» (Studying process of cluster) consists of four term-sets, determined at the interval [0,1]: "unsatisfactory" [0, 0.2], "satisfactory" [0.1, 0.5], "good" [0.4, 0.9], "excellent" [0.7, 1], which determines the level of proficiency of students who study by program of cluster.

Variable "Rez_mob" (Activities of mobile innovational group of cluster for the studied period) consists of three main term-sets, determined at the interval [0,1]: "low results" [0, 0.4], "medium results" [0.1, 0.9], "high results" [0.60, 1] and two additionally introduced term sets: "results below medium" [0, 0.5], "results above medium" [0.5, 1].

Graph of membership functions of fuzzy term-sets of linguistic variable "Str/Tkt_mob" (Strategy/Tactics of mobile innovational group) is the same as Figure 3. With membership function of fuzzy term-sets, linguistic variable "Str/Tkt_mob" will have the following way: $\mu^{H}_{\text{Str/Tkt\_mob}}$(x, 0, 0, 0.4); $\mu^{O}_{\text{Str/Tkt\_mob}}$(x, 0.1, 0.5, 0.9); $\mu^{Y}_{\text{Str/Tkt\_mob}}$(x, 0.6, 1, 1).

During development of model of student evaluation of discipline learning, incoming variables include quantitative factors (number of issues, number of correct answers, total score) and qualitative factors (Learning for "two" (x_{61}), Learning for "three" (x_{62}), "four" (x_{63}), and "five" (x_{64})). Integral accounting of qualitative and quantitative factors is possible with the use of linguistic variables.

Mathematical model of formation of linguistic evaluation of successfulness of students' learning(S) has the following general form (7):

$$S \to Norming \to x_{6i} \to RD6 \to SL \to \sum_{student}^{n} \sum_{dis}^{m} SL, \tag{7}$$

where S – accumulated sum of points; x_{6i} – incoming variables of sixth model, i $\in$ [1,4]; SL–student's successfulness of discipline learning; x61 – learning for "2" (Grade 2); x_{62} – learning for "3" (Grade 3); x63 – learning for"4" (Grade 4); x_{64} – learning for"5" (Grade 5); $\sum_{student}^{n} \sum_{dis}^{m} OY$ – sum of fuzzy evaluations of students in cluster for all disciplines of the studied period. RD6 is rule database, necessary for formation of student evaluation of discipline learning.

Methodology of formation of linguistic evaluation of successfulness of student's learning the discipline consists in the following (Leonenkov 2005, Olishevskiy and Serbinovski 2009):

1. Perform norming of accumulated sum of points for the interval [0..100] according to levels.

2. Set classification scale for linguistic variables x_{6}i, $i = \overline{1,4}$. For example, linguistic variables "*Learning for 2"* (x_{61}), "*Learning for 3"* (x_{62}), "*Learning for 4"* (x_{63}), "*Learning for 5"* (x_{64}) should be interpreted in the form of term-sets with three-place scale T1={НС, СН, ПС}, where value НС does not correspond to the level (for 2, for 3, 4 or 5), СН – corresponds slightly, and ПС – corresponds fully.

3. Set membership functions of quality of variables x_{6}i, $i = \overline{1,4}$. Each of linguistic variables "*Learning for 2 (3, 4, 5)"* has one triangular membership curve (2) and two T-shaped membership curves (Kruglov 2001).

($\mu^{HC}_{x6i}, \mu^{CH}_{x6i}, \mu^{ПС}_{x6i}, i = \overline{1,4}$).

$$\mu_T^j(xi,a,b,c,d) = \begin{cases} 0, & x \le a, \\ \dfrac{x-a}{b-a}, & a \le x < b, \\ 1, & \text{b} \le x \le c, \\ \dfrac{d-x}{d-c}, & c \le x \le d, \\ 0, & d \le x \end{cases} \quad \text{i} = \overline{1,4}, \quad j \in \{T1\}, \tag{8}$$

where a, b, c, d – certain numeric parameters which characterize base of trapezoid (a, d) and upper base of trapezoid (b, c), which take random real values and ordered by ratio: $a \le b \le c \le d$.

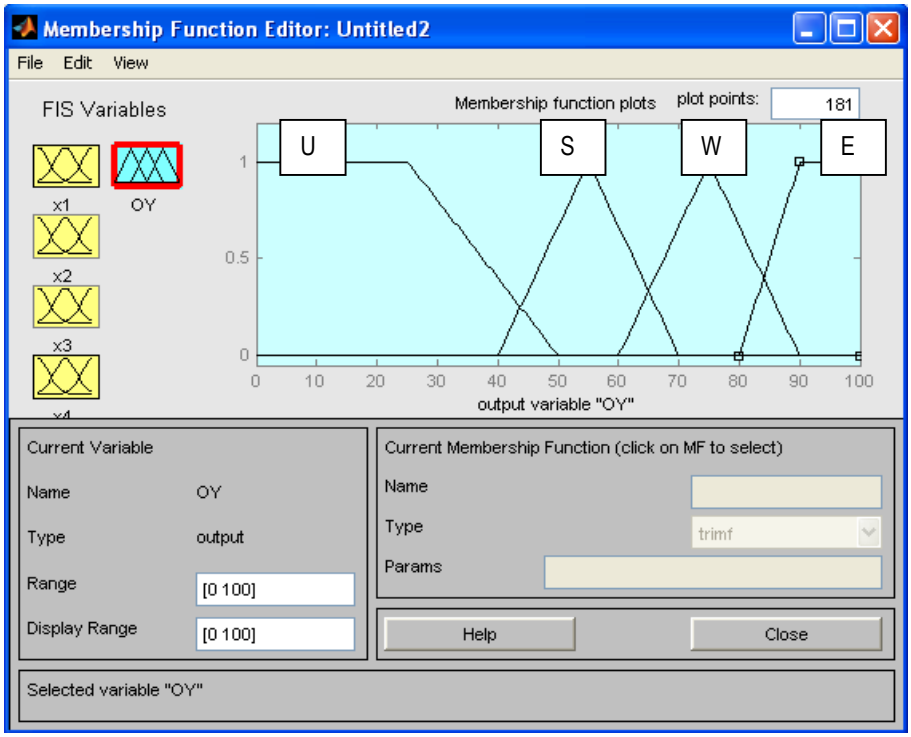
With (2 and 8) membership function of fuzzy term-sets, linguistic variable "*Learning for 2 (3, 4, 5)"* will have the following form:

- 1) $\mu_{\mathrm{T}\,x61}^{\Pi C}$ (x1, 0, 0, 15, 30); $\mu_{\Delta x61}^{HC}$ (x1, 20, 35, 50); $\mu_{\Delta x61}^{CH}$(x1, 40, 55, 100, 100);
- 2) $\mu_{\mathrm{T}\,x62}^{HC}$ (x2, 0, 0, 20, 40); $\mu_{\Delta x62}^{\Pi C}$ (x2, 30, 50, 70); $\mu_{\Delta x62}^{CH}$(x2, 60, 70, 100, 100);
- 3) $\mu_{\mathrm{T}\,x63}^{HC}$ (x3, 0, 0, 50, 70); $\mu_{\Delta x63}^{\Pi C}$ (x3, 55, 70, 85); $\mu_{\Delta x63}^{CH}$(x3, 70, 90, 100, 100);
- 4) $\mu_{\mathrm{T}\,x64}^{HC}$ (x4, 0, 0, 70, 80); $\mu_{\Delta x64}^{\mathrm{CH}}$ (x4, 70, 80, 90); $\mu_{\Delta x64}^{\Pi C}$(x4, 80, 90, 100, 100).

4. Set classified scale of the studied parameter (outgoing variable). For example, linguistic variable "*Student evaluation of discipline learning"* (OY) is interpreted to the form of term-set of values T2={*Unsatisfactory (H), Satisfactory (Y), Good (X),Excellent (O)*}.

5. Set membership functions of quality of the studied parameter. Linguistic variable "*Student evaluation of discipline learning"* has two triangular membership curves and two T-shaped membership curves ($\mu_{OY}^{H}, \mu_{OY}^{Y}, \mu_{OY}^{X}, \mu_{OY}^{O}$). With membership function of fuzzy term-sets, linguistic variable "*Student evaluation of discipline learning"* (OY) will have the following form: μ_{OY}^{H} (x, 0, 0, 25, 50); μ_{OY}^{Y} (x, 40, 55, 70); μ_{OY}^{X} (x, 60, 75, 90); μ_{OY}^{O} (x, 80, 90, 100, 100).

Figure 6 shows graph of membership functions of fuzzy term-sets of linguistic variable "*Student evaluation of discipline learning"* (OY), set in MATLAB.



Source: developed by the authors with Fuzzy Logic Toolbox

Figure 6 - Formation of outgoing linguistic variable "Evaluation of student's learning the discipline" (OY)

6. Determine linguistic value of the level of studied factor. As a result of analysis of subject sphere, rule database RD6 of evaluation of successfulness of student's learning the discipline is formed (Table1).

Table 1 - Fuzzy production rules of RD6 of formation of evaluation of student's learning the discipline

RULE	Variable / Term type	X_{61}	X_{62}	X_{63}	X_{64}	OY
1	does not match	+				OY^E
	matches		+	+	+	
	overmatches				+	
2	does not match	+				OY^W
	matches		+		+	
	overmatches			+		
3	does not match	+			+	OY^W
	matches		+			
	overmatches		+	+		
4	does not match				+	OY^W
	matches	+	+	+		
	overmatches					
5	does not match	+			+	OY^S
	matches	+		+		
	overmatches		+			
6	does not match	+		+	+	OY^S
	matches	+	+			
	overmatches					
7	does not match		+	+	+	OY^U
	matches	+				
	overmatches	+				
8	does not match				+	OY^U
	matches		+	+		
	overmatches	+				

Source: compiled by the authors

Taking into account limitations of the Mamdani algorithm, let us modify the rule database from Table 1 into the form shown in Figure 7.

Semestral student evaluation for each discipline is formed on the basis of maximal sum of points which is equal to 100. If each type of scientific work (F1...Fn) has linguistic evaluation OY = (OY1 … OYn) and weight coefficients p = (p1, …, pn), operator of information aggregation is a weighted sum and is characterized by its linguistic evaluation, determined by membership function at 01-classifier:

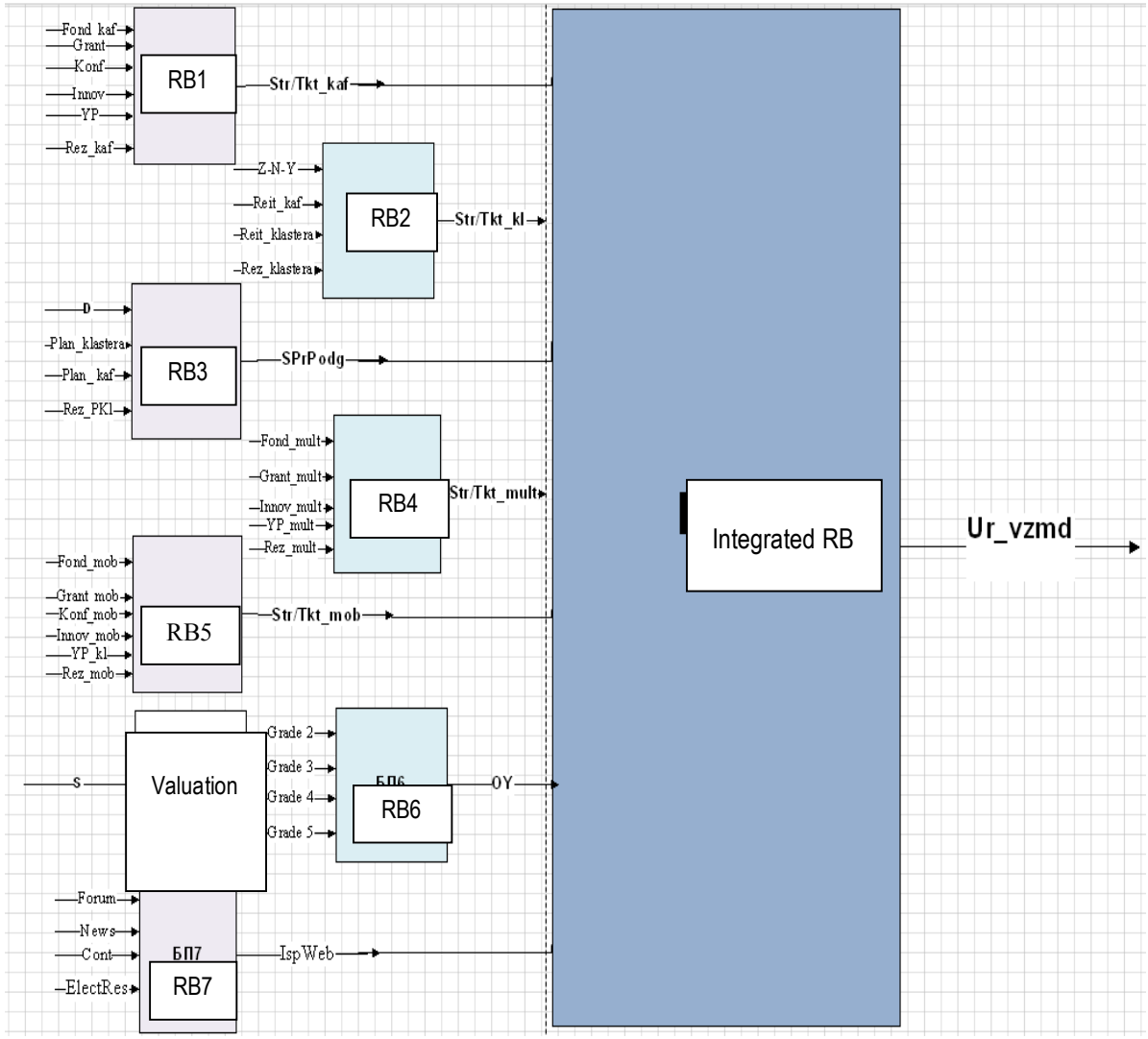
$$\mu_{OY}(x) = \sum_{i=1}^{n} \mu_i(x) p_i \tag{9}$$

For example, distribution with lecturer for the studied period: $\mu_Y(x)$=97 x 0.08 + 79 x 0.08 + 83 x 0.1 + 82 x 0.12 + 87 x 0.12 + 84 x 0.5 = 84.66≈85, which corresponds to the term of linguistic variable OY "Student evaluation of discipline learning O – "Excellent" with certainty level μ_{OY}^{O} = 0.5.

Mathematical model of evaluation of the use of web-resources of cluster could be presented in the following way:

$$x_{7i} \rightarrow LR7 \rightarrow \text{IspWeb}, \tag{10}$$

where: IspWeb – use of web-resources of cluster; x_{7i} – incoming variables of seventh model, $i \in [1,4]$; x_{71} –web-forum of cluster (Forum); x_{72} –news of cluster, located at Web (News); x_{73} –content of web-resources of cluster (content); x_{74} – scientific and methodical E-resources of cluster (ElectRes). RD7is rule database, necessary for formation of evaluation of strategy/tactics of current development of multipliers of cluster.



Source: developed by the authors with MSVisio

Figure 7 - Graph of complex evaluation of the level of cooperation of cluster's academic staff

Each of linguistic incoming variables – similarly to previous models – has triangular membership functions (2).

Variable "Forum" (web-forum of cluster) consists of three term-sets, determined at the interval [0,1]: "very active" [0.6, 1], "active" [0.1, 0.9], "inactive" [0, 0.4], which determines quantity and quality of forum materials.

Variable "News" (cluster news) also consists of three term-sets, determined at the interval [0,1]: "not informative" [0, 0.4], "informative" [0.10, 0.90], "very informative" [0.60, 1] (Figure 7), which determined quantity of viewed news.

Variable "Content" (content of cluster's web-resources) consists of three main term-sets, determined at the interval [0,1]: "not informative" [0, 0.4], "informative" [0.1, 0.9], "very informative" [0.60, 1], reflective quality and quantity of used and implemented web-technologies (application, cross-platforms, cloud services, etc.).

Variable "ElectRes" (Academic electronic resources of cluster) consists of four term-sets, determined at the interval [0,1]: "not in demand" [0, 0.4], "in demand" [0.1, 0.9], "in high demand" [0.6, 1], which determined number of downloads of all academic and organizational materials from the clusters' web-system.

Graph of membership functions of fuzzy term-sets of linguistic variable "IspWeb" (Use of cluster's web-resources) is similar to Figure 3. With membership function of fuzzy term-sets, linguistic variable "IspWeb" will have the following form:

$$\mu^{H}_{\text{"IspWeb}}(x, 0, 0, 0.4);\ \mu^{O}_{\text{"IspWeb"}}(x, 0.1, 0.5, 0.9);\ \mu^{Y}_{\text{"IspWeb}}(x, 0.6, 1, 1).$$

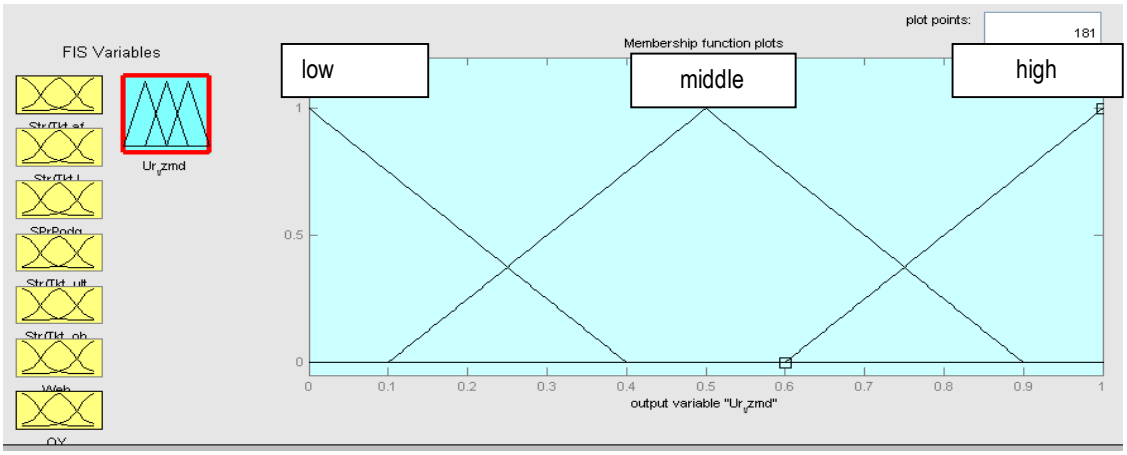
Development of second level model

Mathematical complex evaluation of the level of cooperation of academic staff of universities of cluster can be presented in the following form (11):

$$x_{7i} \rightarrow RD7 \rightarrow \text{Ur\_vzmd}, \quad (11)$$

where Ur_vzmd – level of cooperation of academic staff of cluster; x_{7i} – incoming variables of a complex model, i $\in$ [1,7]; x_{71} – strategy and tactics of development of the chair which belongs to cluster of realization of program in the sphere of informational security (Str/Tkt_kaf); x_{72} – strategy and tactics of development of cluster for realization of program in the sphere of informational security (Str/Tkt_kl); x_{73} – level of professional training of academic staff of cluster (SPrPodg); x_{74} – strategy and tactics of development of cooperation program of cluster's multipliers (Str/Tkt_mult), x_{75} – strategy and tactics of development of mobile innovational cluster group (Str/Tkt_mob), x_{76} – student evaluation of discipline learning (OY),x_{77} – use of cluster's web-resources (Web). RD7 is rule database, necessary for formation of complex evaluation of cooperation level of academic staff of cluster.

For illustration purposes of model (11), let's view Figure 8.



Source: developed by the authors with the use of Fuzzy Logic Toolbox

Figure 8 - Graph of membership function of fuzzy term-sets of linguistic variable "Ur_vzmd"

All graphs of membership functions of fuzzy term-sets of incoming linguistic variables of final model of evaluation of cooperation level of academic staff of universities of cluster could be seen in previous models as resultative variables:

- input1 in model corresponds to linguistic variable "Str/Tkt_kaf";
- input2 in model corresponds to linguistic variable "Str/Tkt_kl";
- input3 in model corresponds to linguistic variable "SPrPodg";
- input4 in model corresponds to linguistic variable "Str/Tkt_mult";
- input5 in model corresponds to linguistic variable "Str/Tkt_mob";
- input6 in model corresponds to linguistic variable "OY";
- input7in model corresponds to linguistic variable "Web".

Figure 9 shows the graph of membership functions of fuzzy term-sets of linguistic variable "Ur_vzmd" (cooperation level of academic staff of universities belonging to cluster).

Ur_vzmd | Ur_vzmd.rule

1x2916 struct with 4 fields

Fields	antecedent	consequent	weight	connection
1891	[2 3 3 2 2 3 1]	2	1	1
1892	[2 3 3 2 2 3 2]	2	1	1
1893	[2 3 3 2 2 3 3]	2	1	1
1894	[2 3 3 2 2 4 1]	2	1	1
1895	[2 3 3 2 2 4 2]	2	1	1
1896	[2 3 3 2 2 4 3]	3	1	1
1897	[2 3 3 2 3 1 1]	2	1	1
1898	[2 3 3 2 3 1 2]	2	1	1
1899	[2 3 3 2 3 1 3]	2	1	1
1900	[2 3 3 2 3 2 1]	2	1	1
1901	[2 3 3 2 3 2 2]	2	1	1
1902	[2 3 3 2 3 2 3]	2	1	1
1903	[2 3 3 2 3 3 1]	2	1	1
1904	[2 3 3 2 3 3 2]	2	1	1
1905	[2 3 3 2 3 3 3]	3	1	1
1906	[2 3 3 2 3 4 1]	2	1	1
1907	[2 3 3 2 3 4 2]	3	1	1
1908	[2 3 3 2 3 4 3]	3	1	1
1909	[2 3 3 3 1 1 1]	1	1	1
1910	[2 3 3 3 1 1 2]	2	1	1
1911	[2 3 3 3 1 1 3]	2	1	1
1912	[2 3 3 3 1 2 1]	2	1	1
1913	[2 3 3 3 1 2 2]	2	1	1

Source: compiled by the authors with MatLab

Figure 9 - Fragment of the RD7 of formation of Ur_vzmd - Level of cooperation of cluster's academic staff"

With membership function of fuzzy term-sets, linguistic variable "Ur_vzmd" will have the following form: $\mu^{H}_{\text{Ur\_vzmd}}$(x, 0, 0, 0.4); $\mu^{C}_{\text{Ur\_vzmd}}$(x, 0.1 , 0.5, 0.9); $\mu^{B}_{\text{Ur\_vzmd}}$(x, 0.6, 1, 1).

Rule database RD7 will include large number of rules: more than 3^7=2187 (seven variables each with three terms, as variable "OY" has three terms; there will be more rules).

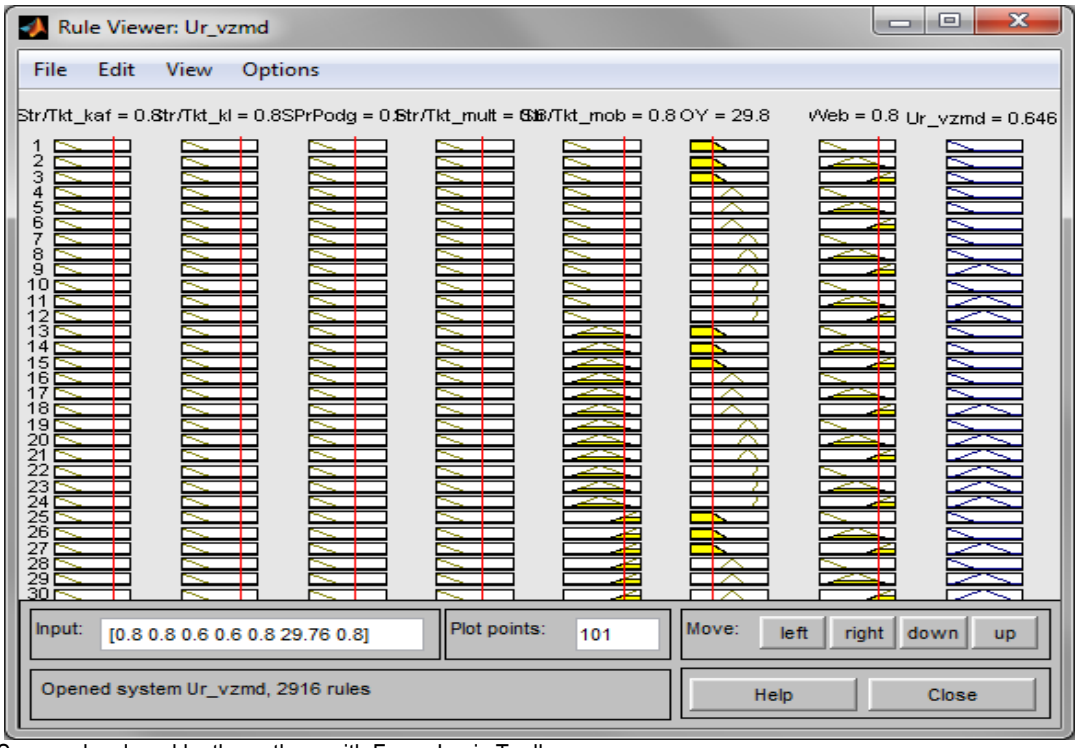
The authors offer algorithm of formation of rule database for fuzzy conclusion of linguistic variable "Ur_vzmd", realized in MatLab, consisting of functions of rules generation and distribution of consequences for outgoing variable.

Function generating_rules:

```
s=1;
for i1=1:1:3
for i2=1:1:3
for i3=1:1:3
for i4=1:1:3
for i5=1:1:3
for i6=1:1:4
for i7=1:1:3
Ur_vzmd.rule(s).antecedent = [i1 i2 i3 i4 i5 i6 i7];
Ur_vzmd.rule(s).weight = 1;
Ur_vzmd.rule(s).connection = 1;
s=s+1;
end
end
```

```
Function con sequences:
for s=1:1:2916
sum=0;
for i=1:1:7
sum=sum+Ur_vzmd.rule(s).antecedent(i);
end
if sum>=19
Ur_vzmd.rule(s).consequent=3;
elseif sum>14 & sum <19
Ur_vzmd.rule(s).consequent=2;
else
Ur_vzmd.rule(s).consequent=1;
end
end
```

Figure 10 shows fragment of generated rule database RD7.



Source: developed by the authors with Fuzzy Logic Toolbox

Figure 10 - Example of realization of rules of fuzzy inference of fuzzy model of evaluation of the level of cooperation of cluster's academic staff

Results

Accumulation of inferences was performed by the authors with the use of operation of max-disjunction. For defuzzification, method of center of gravity was used for discrete of multitude of membership functions:

$$y' = \frac{\sum_{r=1}^{Y_{max}} y_r \mu_{B'}(y_r)}{\sum_{r=1}^{Y_{max}} \mu_{B'}(y_r)}, \quad (12)$$

where: Ymax – number of elements Yr in the sphere Y, discretized for calculation of "center of gravity".

Results of variable Ur_vzmd (level of cooperation of academic staff of cluster) equal 0.646, which matches term "medium" with certainty level $\mu^{C}_{\text{Ur\_vzmd}}$= 0.9. With setting criterion of significance of certainty level KrZ=0.05, the received value of resultative variable is accepted.

In next realization of fuzzy model of evaluation of the level of cooperation of academic staff of cluster, fuzzy inference of resultative linguistic variable "Ur_vzmd" is shown:

1) Input [0.3 0.2 0.2 0.2 0.3 51 0.4] – Output 0.153 (term "low" with certainty level $\mu^{H}_{\text{Ur\_vzmd}}$= 0.95;
2) Input [0.5 0.4 0.3 0.5 0.3 77 0.4] – Output 0.4513 (term "medium" with certainty level $\mu^{H}_{\text{Ur\_vzmd}}$= 0.83;
3) Input [0.8 0.9 0.9 0.9 0.85 84 0.9] – Output 0.839 (term "high" with certainty level $\mu^{H}_{\text{Ur\_vzmd}}$= 0.65.

Conclusions

- A set of fuzzy models of evaluation of cooperation level of academic staff of universities which belong to cluster was developed.
- The offered methodology allows performing integral accounting of qualitative factors (strategy and tactics of chair/cluster, rating of academic staff of chair/cluster, evaluation of proficiency of cluster's students, use of clusters' web resources, etc.) – on view of their uncertainty. Setting the criterion of significance of certainty level, it is possible to change final results, depending on the group level of cooperation in cluster.
- It is experimentally determined that use of this approach allows obtaining evaluation of the level of cooperation of academic staff of cluster, which proved efficiency of its application during development of complex approach to perfection of organization and management of existing clusters in the sphere of informational security.

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Comparison of Resource Related Sectors with Non-Resource Sectors from the Point of View of Economic Growth and Dutch Disease Potential, Studied on the Case of Four Resource Dependent Countries

TOMÁŠ HES
Czech University of Life Sciences Prague
Faculty of Tropical AgriSciences, Czech Republic
2586rm@gmail.com

Haiyan SULAIMAN
Czech University of Life Sciences Prague
Department of Economic Development, Prague, Czech Republic
sulaimain@ftz.czu.cz

Samuel MINTAH
Czech University of Life Sciences Prague
Department of Economic Development, Prague, Czech Republic
mintah@ftz.czu.cz

Ali SALMAN
Syrian Virtual University, Damascus, Syrian Arab Republic
alitosalman@gmail.com

Abstract:

The Dutch Disease phenomenon makes scholars conclude on the base of the historical empiric evidence, that natural resources can be actually a thread to the long-term stability and prosperity of countries. This view of natural resources as a curse rather than a blessing was shown on many cases of national economies. No studies had however compared different commodities in order to draw a conclusion on the severity of their impact on GDP growth with other sectors and also on the lagged impact in a mid-term time span. The study compares on the base of historic longitudinal panel data analysis, selected types of resources with a Dutch Disease impact potential on GDP creation, such as crude oil and gold and compares these with agricultural and industrial output and high-tech exports in chosen countries.

Keywords: Dutch disease, oil production, gold, panel data

JEL Classification: Q20.

1. Introduction

Economic growth is to a major extent induced by learning by doing, in agriculture as well as manufacturing (Torvik 2001) and not by resource based windfall. The Dutch disease or the "Natural Resources Cause" (Allcot *et al*. 2014) is the designation of a process related to a boom in the sector or natural resources, which causes reduction of non-resource sectors and deindustrialization. Paraphrased, it is a market failure causing negative externalities impacting on sectors of services and tradable goods and services, in preventing these from organic development (Bresser-Perreira 2013). The phenomenon is based upon the concept of Ricardian rent, defined by dynamics of international markets and creating a cost differential between the cost of less efficient producers present in the market and the cost of countries producing the natural resource the commodity on account of its natural reserves. While according to Ricardian rent concept the owners of the most productive lands are the principal beneficiaries, some scholar see the curse of this rent-seeking following oil exports as well as exports of other mineral resources. In the short run, local consumers can purchase tradable goods cheaper than in a situation without Ricardian rent, however in the long run sophistication of production will be impeded, as labor is transferred to resource extraction sectors with higher value created per capital.

If the view of Corden and Neary (1982) on the division of economy into sectors of natural resources, non-resource tradable including manufacturing and agriculture as well as non-tradable sectors including construction and non-tradable services is accepted, then it is realistic to expect the existence of a spending effect (increased spending due to resource related income leading to increase imports) and the resource movement effect (rise of labour costs due to rising marginal product of labour), both being the cause for Dutch disease phenomenon, resulting from the impact of non-natural resources relative to the impact of non-tradable assets.

In 2006 the Center for Global Development identified the Dutch disease as a term used by economists to describe a reduction in a country's export performance as a result of an appreciation of the exchange rate after a natural resource. The natural resources can be as much a curse as a blessing, and the Dutch disease is as a case of "resource curse" or "paradox of plenty", existing even if the commodities that give rise to it have high technological content, as is currently the case of oil production. (Bressser-Pereira 2008)

In other words, the Dutch disease can be labelled as re-allocation of capital from tradable to non-tradable sectors, leaving the markets more open to economic shocks. Evidence shows that fluctuations of commodity prices have strong impact on domestic spending, lead to output variabilities of commodity exporters and especially those that are less developed from the point of view of financial development, with less pro-cyclical fiscal policies and inflexible exchange rates. (IMF2015). Natural resources derived wealth exacerbates weaknesses of institutions (Brahmbhatt 2010), but can also actually deteriorate governance (Collier *et al*. 2007). The term, was coined in 1977 by the Economist (2014) in reaction to Dutch economy which was characterized by reduction in manufacturing due to discovery of large gas reserves in the Northern Sea leading to increased demand for the currency thus leading to appreciation of the Dutch Guilder, causing inflation which in turn reduced profitability and competitiveness of the national output, lower interest rates and crippled the economic potential of the country. The argument on the comparative advantages of the resource rich economies is however controversial, since the commodity prices tend to fluctuate and in times of low prices economies without developed back-up sectors incur into troubles. According to Stiglitz (2004), three major impacts of Dutch Disease can be identified: the focus on non-productive activities mal-allocating development effort, often leading to wars and corruption with secondary effects, dependence of by default volatile commodity and crowding out of other economic sectors. Kareem (2010) studied Dutch disease in a study examining oil-exporting countries using Heckscher-Ohlin factor endowment model in the period of 1977 – 2004 and found out that oil booms lead to reduced manufacturing output, that windfall shocks had negative impact on markets rather in countries with open capital markets to FDI, that the price of labor to capital as well as capital intensity appreciated thanks to a windfall and that high capital and high diversification intensity economic sectors are less impacted by windfall shocks. Collier and Goderis (2007) used a panel co-integration method for 130 countries in a period between 1963-2003, reached the conclusion that commodity price booms had positive short-term impacts related to growth, this impact would however be negative in the long term and would be restricted to countries with low quality governance and essential natural resources such minerals and oil. Reinhart and Rogoff suggested in 2010 that Dutch disease induced external debt rising over 60% leads to a decline of 2% of GDP growth.

The study of 97 developing markets, with high natural resource exports to GDP showed low GDP growth between 1970s and 1980s (Economist 2014). Smith (2014) replicated calculations done by Black et al. (2005) in examining the impacts of oil price booms and subsequent busts for 19 oil-dependent markets did not contradict the negative view of the Dutch Disease model, however showed a strong negative relationship to price levels in case of countries with high non-hydrocarbon natural resources as well as agricultural products, suggesting move towards industrialization, caused by oil related windfall. His study suggests that there is ambiguity related to effects of oil boom and its impact on other sectors, as they do not imply mechanisms related to Dutch Disease including the spending effects or the resource movement, and thus raised doubts on the simplified explanations of the oil windfall related impact. Allcot *et al.* in 2014, examined the Dutch Disease in selected U.S. counties, using panel dataset of gas and oil production since the 1960s until the present time and came to the conclusion that manufacturing benefits from resources related windfall, due to pro-cyclical inputs, however limit their findings on local production as well as local manufacturing not taking into account related issues on scale of national states. Bjørnland *et al*. (2014), used a Bayesian Dynamic Factor model and quantified the impact of a fall of oil prices by 25% to by 2-2.5 percent of Norwegian economy.

However, pure resource-based dependency may not be a simple explanation. Stiglitz puts forward in his article for Guardian (2004) an exemplary case of such Dutch Disease doubt the comparison between Indonesia and Nigeria, both dependent on oil and having a similar level of per capita income in 164, yet today per capita income of Indonesia is four times Nigeria's, which has actually, as measured in constant dollars since 1995, fallen. A pattern alike could be observed in Sierra Leone as well as in Botswana, both dependent on diamond export. However, Botswana averaged 8.6% GDP growth over the past three decades, while Sierra Leone entered in a protracted civil conflict. Gold mining, is a great sector in at least 34 African countries, a large number of resource-rich African countries did not get a good benefit from their resource endowments. The reason behind this situation is the fact that countries received small shares of the revenues from Gold mining sector and sometimes because of foreign direct investment have negative effect in this sector (Gajigo *et al*. 2012). Economies that are dependent on natural resources when the source of the exploited natural resource depletes or the value declines

internationally, the country is left without a booming sector and with its remaining economy weakened and prone to "Dutch Disease." This phenomenon is named for the experience of the Dutch economy in the 1960's. After natural gas was discovered in the North Sea, increased production of gas "crowded out" other activities. Essentially countries experiencing "Dutch Disease" like Africa countries find that resources shift into the booming natural resource sector resulting in decreased production in other sectors particularly manufacturing and agriculture. In addition, an appreciation of the real exchange rate often exacerbates the phenomenon by making domestic products more expensive on international markets. This depresses domestic export industries. In the 2009 with the report of the World Economic Forum (WEF), which showed Ghana as relatively weak in related areas of technology, innovation, education, health, market competition and labor market efficiency. These findings suggest that skills and productivity is the most importance competitiveness challenge facing Ghanaian enterprises. Akanni (2007) studied Oil Wealth and Economic Growth in Oil Exporting African Countries found that oil revenues in oil exporting African countries have failed to promote growth, increase welfare or solve migration problems. To find more evidence about Dutch disease in oil-rich countries by the study of Treviño (2011) on the 14 member countries of CFA franc zone, who divided them into two groups of oil exporter and non- exporter by studying some indicators like economic growth, GDP and real exchange rate, the results clearly refer to existence Dutch disease into oil exporter group during the oil-price boom. Chukwuka *et al.* (2013) studied the effect of oil discovery in Nigeria on agriculture sector activity by using annual time series data from Central Bank of Nigeria, and the study was focusing in relationship between agricultural commodity export and oil export by using co-integration and vector error correction model (VECM), so these results showed that Dutch disease is exist in Nigeria because with 1% increase in oil export the agricultural commodity export will decrease by 16% with less competitive in international markets, these results in the same context with Olusi (2007) and Oyesanmi (2011) whose found that Dutch Disease exist in the Nigerian case. Also Dutch disease has a negative impact on Nigeria's and Indonesia's agriculture sectors because of local currency appreciation which affected on labour, land markets and cropping pattern and at the end led to less competitive (Rudd 1996), another evidence from Brazilian economy with overvaluation of the exchange rate over the last years because of impressive growth of oil which reflected on decreasing economy performance and its competitive ability, which lead us to say it is a case of resources curse (Ueno 2010).

2. Data and methodology

2.1. Data

The data was chosen from four countries with a high Dutch Disease potential, due to their dependence of natural resources for the period 2002-2011: Ghana, Russia, Saudi Arabia and Venezuela. Ghana has a great gold sector but relatively weak in related areas of technology, innovation, education, health, market competition and labor market efficiency, in addition to receive small shares of the revenues from gold mining sector (Gajigo *et al*. 2012). Venezuela is one of the world largest exporters of crude oil. 80% of export earning come from oil, Accounts for 50% of the Gov. Revenue and one-third of the country's gross domestic product (GDP) (Weiner, 2000). Russia is one of the major global suppliers of oil, provides about 13% of the world market. 30% of GDP in Russia comes from exports, however raw materials account for 90% of the goods exports, two-thirds of these raw materials consist of just two products: oil and natural gas (Oomes and Kalcheva, 2007). Saudi Arabia is an interesting country in terms of Dutch Disease as it is the largest oil producing country in the world, with production arrived approximately 10.3 Million barrel in March 2015 with increasing about 450,000 barrel from February in the same year, so with this a heavy dependence on natural resource there is at least one condition of Dutch Disease requirement was achieved. As to independent variables annual gold production (*g*), annual crude oil production (*o*), GDP (*y*), inflation (*i*), population growth (*p*), high-technology exports (*t*), agricultural output (*a*), value-added industry (*id*)and trade in services (*td*)were selected (USGS 2014, OECD 2014; FAOSTAT 2014, WB Data 2015). Population growth and inflation were included in the equation in order to eliminate impact of unrelated influences on GDP growth.

Table 1 - Descriptive statistics of the data sample

	Gold (kg)	Crude Oil (toe)	GDP (US $)	Inflation (annual %)	Pop. growth (annual %)	High-technology exports (000 of US $)	Agriculture (000 US $)	Industry, value added (US $)	Trade in services (US $)
Mean	65449.88	223697.8	3.36E+11	14.25	1.67	1272224	15457761	1.48E+11	1.73E+11
Standard Err.	10909.32	35835.37	4.98E+10	1.71	0.19	333524	2275252	1.88E+10	3.04E+10
Median	37569.5	181332.5	2.22E+11	11.28	2.14	121189	9993392	1.17E+11	1.01E+11
Std. Dev.	68996.57	226642.8	3.15E+11	10.84	1.18	2082860	14389963	1.19E+11	1.92E+11
Kurtosis	-0.95488	-2.05682	-0.74492	0.75	-0.89	-0.389206	-0.63538	-1.40357	-0.37672
Skewness	0.782122	0.04	0.767292	1.07	-0.82	1.233140	1.088396	0.198859	1.094252
Count	40	40	40	40	40	40	40	40	40

2.2. *Estimation methods*

The comparison of different sectors and their effect on Dutch Disease phenomenon (see Regression 1) uses balanced cross-sectional time-series data using multivariate ordinary least squares (OLS) method with one year and two year lags for all variables, observing behaviour of logarithmically transformed macroeconomic indicators[17] across the time span of 10 years. Fixed effects model of panel data OLS is chosen rather than random effect model, as variance between the coefficients caused by multiple time-invariant elements of the sample countries is not to be omitted and the causes of general changes are studied within chosen markets and panel data reflects dynamics as well as Granger causality rather than cross-sectional analysis (Diggle et al., 2002). The comparison of country-specific situations in relation to Dutch Disease impact caused by chosen variables (see Regression 2), is performed with individual logarithmically transformed time-series data using multivariate ordinary least squares (OLS) method with Robust Standard Errors, observing behavior of macroeconomic indicator across the time span of 10 years and subsequent comparison of the achieved results. Statistic fit and F-test was applied for both calculations in order to confirm the robustness.

Eq. 1 Relationship between the GDP growth and chosen variables in chosen countries:

$$\ln y_1 = \alpha + \ln \beta_1 g_{it} + \ln \beta_2 o_{it} + \ln \beta_3 i_{it} + \beta_4 p_{it} + \ln \beta_5 t_{it} + \ln \beta_6 a_{it} + \ln \beta_7 id_{it} + \ln \beta_8 td_{it} + \varepsilon_{it}$$

Table 2 - Coefficients of the regression applied

VARIABLE	COEFFICIENT
y	Be a performance variable of GDP
α	Be the intercept of the regression line and the Y axis
g_{it}	Annual production of gold
o_{it}	Annual production of oil
i_{it}	Annual inflation
p_{it}	Annual population growth
t_{it}	High-technology exports
a_{it}	Annual agricultural output
id_{it}	Industrial value added
td_{it}	Trade in services
β_{1-8}	Coefficient
ε_{it}	Error term

Eq. 2 Relationship between the GDP growth and chosen variables in one particular country with one-year lag:

$$\ln y_1 = \alpha + \ln \beta_1 g_{t-1} + \ln \beta_2 o_{t-1} + \ln \beta_3 i_{t-1} + \beta_4 p_{t-1} + \ln \beta_5 t_{t-1} + \ln \beta_6 a_{t-1} + \ln \beta_7 id_{t-1} + \\ + \ln \beta_8 td_{t-1} + \varepsilon_{it-1}$$

[17]Population growth, due to negative values was not log-transformed.

Eq. 3 Relationship between the GDP growth and chosen variables in one particular country with two years' lag:

$$\ln y_1 = \alpha + \ln \beta_1 g_{t-2} + \ln \beta_2 o_{t-2} + \ln \beta_3 i_{t-2} + \beta_4 p_{t-2} + \ln \beta_5 t_{t-2} + \ln \beta_6 a_{t-2} + \ln \beta_7 id_{t-2} + \\ + \ln \beta_8 td_{t-2} + \varepsilon_{it-2}$$

2.3. Results and discussion

The panel data analysis applying Regression 1 formula, provided four statistically significant results on resources and sectors that have influenced in an important way the GDP growth in the data sample in the year of output as gold (p=0.0540), crude oil (p=0.0140), industry value added (p=0.0022), trade in services (p=0.0002) and agriculture (p=0.0001) had resulted as the statistically significant (see Tab. 3). As to lagged values that showed to be statistically significant, it was gold with two years' lag (p=0.0540), crude oil with one-year lag (p=0.0001), industry value added with one and two years lag (p=0.0145, p=0.0007), trade in services with one-year lag (p=0.0001) and agriculture with 2 years lag (p=0.0001). The standard deviation of the output variable (1.56) shows little variation, the coefficient of determination (R^2) represents the fit of a regression line of 99.9%. It is also a measure of the proportion of variability of the dependent variable and shows the strength of relationship between the dependent and independent variables. The multiple coefficient of determination (R^2) for the regression model is 0.99 indicates that 99% of the variations in the determinants of the dependent variable were explained by the variables included in the sample, while Durbin-Watson test value (2.15) indicates that there is little autocorrelation. LSDV R-squared related to fixed effects provides us with confirmation of non-stochastics, unbiased and liner consistent data, while Rho (-0.22) denotes a weak correlation between variables and F-tests for common intercept and named regressors (0.02;0.00) confirm normality of the sample (see Table 4).

Table 3 - Statistically significant results of the panel data analysis

Sector	Coefficient	Std. Error	t-ratio	p-value
Gold	−0.1019	0.0468854	−2.17	0.0540
Gold_2	−0.0168685	0.00497769	−3.3888	0.0007
Crude Oil	−0.0220	0.0074	−2.95	0.0140
CrudeOil_1	−0.0554884	0.00551878	−10.0545	0.0001
Industry Value Added	0.5621	0.0241	23.32	0.0022
Industry Value Added	−0.344072	0.140747	−2.4446	0.0145
Industry Value Added	−0.036382	0.0107651	−3.3796	0.0007
Trade in services	0.4243	0.0444	9.545	0.0002
Trade in services_1	0.0715335	0.00231029	30.9630	0.0001
Agriculture	0.0334733	0.00467846	7.1548	0.0001
Agriculture_2	−0.0216432	0.000755049	−28.6647	0.0001

Table 4 - Results of testing

Test	Value	Test	Value
Mean dependent var	25.86	S.D. dependent var	1.56
Sum squared resid	0.01	S.E. of regression	0.014
LSDV R-squared	0.99	Within R-squared	0.99
LSDV F(25, 10)	18064.63	P-value(F)	2.77E-20
Log-likelihood	126.42	Akaike criterion	−200.83
Schwarz criterion	−159.66	Hannan-Quinn	−186.46
Rho	−0.22	Durbin-Watson	2.16
F-test (common intercept)	0.02	F-test (named regressors)	0.00

The results show an important impact of natural resources in the chosen four countries on GDP growth, confirms the Dutch Disease potential. Gold extraction seems to have been more important influence on GDP growth than crude oil production, which however has little generalization potential, due to limited sample of four countries. The impact is however rather immediate or hard to predict as nor in case of oil nor in case of gold can be seen a balanced impact during the three years measured. The impact on economic growth in the measured countries can be however traced back to industry value added, trade in services as well as to agriculture, with more important values than gold and oil. Unsurprisingly, high-tech exports showed no important values, when compared to resources or the sectors of trade, agriculture and industry. On the base of the aforementioned findings,

it can be therefore stated, that industry, trade as well as agriculture play rather a more important role on GDP growth in countries that can be defined as prime Dutch Disease candidates. One of the explanations can consist in the fact that the level of extraction of natural resources was constituted an important share of the GDP and therefore the growth was driven by other sectors.

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Conclusion

The measurement of four countries that represent potentially important Dutch Disease target countries showed a striking importance of industry, services as well as trade sector on the GDP growth in the period of 11 years, which is comparable or more important than the contribution of extractive sector. The explanation of this finding can lie in the fact, that extraction of resources did contribute an important share to national GDP volume decades ago, yet rather contributed less to GDP growth than the sector mentioned. This would imply a possible illumination on the dangers of Dutch Disease as a phenomenon especially crucial during a period of growing output of the natural resources contribution to GDP, while after reaching a certain threshold, such as the extraction capacity limits, the complementary sectors of economy can become actually responsible for GDP growth in a more dramatic way than the extraction itself. Development of social capital is a precursor to long-term economic growth, in the view of mainstream economics being a hydraulic system situated in time as well as in space. Abundant natural resources should be a blessing, not a curse and can become one, if the exploitation of natural resources happens with measured approach and in balance with development of other principal economic sectors. This in other words requires robust planning on macroeconomic level, with complex coordination between different frameworks of governance and includes imposition of limits in the extraction sectors, which is rather more difficult to put into practice than to consider from a theoretical point of view and which actually goes against the laissez faire neoliberal market view. In other words, not the resources themselves, but incapacity to see a wider panorama of the market system as well as a view of long term economic perspectives, implies the Dutch Disease potential. Rent-seeking behavior and short termism of state officials, and natural resources wealth grab, which is less complicated than a strenuous, gradual development of industries and commercial infrastructures, in combination with dependence and volatility of the prices of resources, can be indeed detrimental to creation of the pool of social capital and crowd out other, in the short term less lucrative activities, which can however at the end provide and incomparably more important contribution to balance the satisfaction of economic needs.

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Evidence of Financial Crisis in the Banking Sector of the Republic of Kosovo

Arbër H. HOTI
University of Pristina, Faculty of Economics, Kosovo
arber_hoti@hotmail.com

Artor R. NUHIU
University of Pristina, Faculty of Economics, Kosovo
artornuhiu@gmail.com

Arben DERMAKU
University of Pristina, Faculty of Economics, Kosovo
adermaku@hotmail.com

Abstract:

Commercial banks in Republic of Kosovo have undergone major changes since the beginning of their establishment after the end of the war in 2000. Changes mainly resulted from technological changes, changes in the regulatory environment, the entry into the market of foreign capital banks and as a result of increased competition. Due to these changes, particularly as a result of the last global financial crisis in 2008, commercial banks in general were faced with rising operating costs, which may have affected their profitability, liquidity and credit quality.

Our research evaluates the performance of commercial banks in the Republic of Kosovo during the period 2006 - 2012 by utilizing the method of financial ration analysis. We have also utilized the statistical t-test to analyze the impact of the recent global financial crisis on the performance of commercial banks in the Republic of Kosovo.

The paper is organized as follows: Section 1 provides an analysis of the banking sector in Kosovo and macroeconomic indicators for the period analyzed. Section 2 provides a literature review on the performance of banks in other countries. Section 3 describes the research methodology and assumptions. Section 4 presents the results of research. While Section 5 consists of the summary of the research and provides our main conclusions.

Keywords: bank performance; profitability; global credit crisis; liquidity; credit quality.

JEL Classification: M40, M41, E50, E60.

1. Introduction

Kosovo banking sector consists of commercial banks activity. During the period of analysis, the number of banks has gradually increased. In the year 2006 the total number of commercial banks operating in Kosovo was 6, while on the year 2013 the total number of commercial banks operating in Kosovo was 9, which are: ProCredit Bank (ex-MEB – Micro Enterprise Bank), Raiffeisen Bank (ex-American Bank of Kosovo), Bank for Business (ex-Business Private Bank), Nova Ljublanka Banka (NLB) Prishtina (established by merger of KasaBank dhe New Bank of Kosovo (BRK), Economic Bank, National Trade Bank Kosovo Branch (BKT), Türk Ekonomi Bankasi (TEB), Isbank and one branch of Komercijalna Banka A.D. of Belgrade who is operating only in the north side of Mitrovica and in Gracanica.

Seven of these banks are well established and have their branches operating throughout Kosovo. It should be noted that only two of the banks in Kosovo have local capital (Bank for Business and Economic Bank), while other banks are banks with foreign capital (the shareholders are not Kosovars). This appears as a new trend in the Kosovo market.

Despite many services which are provided by commercial banks in Kosovo, lending remains their principal activity. It should be emphasized that the demand for money, in a country in transition such as Kosovo, is significantly greater than the supply of money, so the importance of lending remains very high.

Of course, the lending (credit issuance) activity must be genuine and sound and banks should maintain their stability and liquidity. In achieving this objective, the completion of legal financial regulatory framework has played a great role, and also without prejudice, the strict supervision by the Central Bank of the Republic of Kosovo (hereinafter: CBK). Another feature of the overall financial sector in Kosovo is that it is still dominated by the banking sector, with a share of 70-75% percent of total financial system assets (Financial Stability Report 2010-Central Bank of Kosovo).

The main sources of financing of the banking sector in Kosovo are domestic deposits and domestic borrowings, which represent about 70-80% of all liabilities. This represents a great advantage for Kosovo banking sector, since they are not linked directly to international financial markets, and this has directly reduced the impact of the global financial crisis in the Kosovo banking sector.

The global financial crisis of 2008 has had a great impact on the global economy. Many countries entered recession, while in some countries, economic growth slowed down significantly. As a result of the 2008 financial crisis and its response, many countries were forced to increase public spending to reduce the effects of the crisis and stimulate economic growth. Central Banks also reacted, which were obliged to apply expansionary monetary policy. These measures had a high impact in eliminating the impact of the crisis, offsetting the decline of activity in the private sector by increasing public sector participation in the economy.

Since commercial banks in Kosovo are mainly of foreign capital, in 2009, the banking systems in the countries where the foreign banking groups have subsidiaries in Kosovo were characterized by slower growth, difficulties in obtaining financing and deterioration of their credit portfolio quality (Financial Stability Report 2010-Central Bank of Kosovo). As a result of this, this contributed to the reduction of the overall profitability of the banking system during and after year 2008.

However, relying on statistical data of Table 1 and Figure 1, it can be noted that during 2006-2012, the banking sector in Kosovo, namely loans and deposits have been increasing steadily, despite the appearance of the global financial crisis and its effects worldwide. But this does not mean that the global financial crisis had not affected the performance and efficiency of these banks.

Table 1 - Key economic indicators of the economy of Kosovo during the period 2006-2012

	2	2007	2008	2009	2010	2011	2012
Real GDP growth GPD (%)	3.4	8.2	7.2	3.5	3.2	4.5	3.8
Inflation (average annual%)	3.9	4.4	9.4	-2.4	3.5	7.3	2.5
Loans (Mil EURO)	577	820	1,183	1,289	1,459	1,698	1.763
Deposits (million euros)	923	1,111	1,444	1,745	1,937	2,104	2,279
Exports (million euros)	79	165	199	165	294	313	269
Imports (million euros)	1,315	1576	1,928	1,936	2,145	2,479	2.489
Government expenditures (million euros)	1,043	1,003	1,301	1.307	1,504	1,698	1,783

Source: Kosovo Statistical Agency (Economic Statistics, Series 3), Central Bank of Kosovo (Financial Bulletin no. 8 and 10).

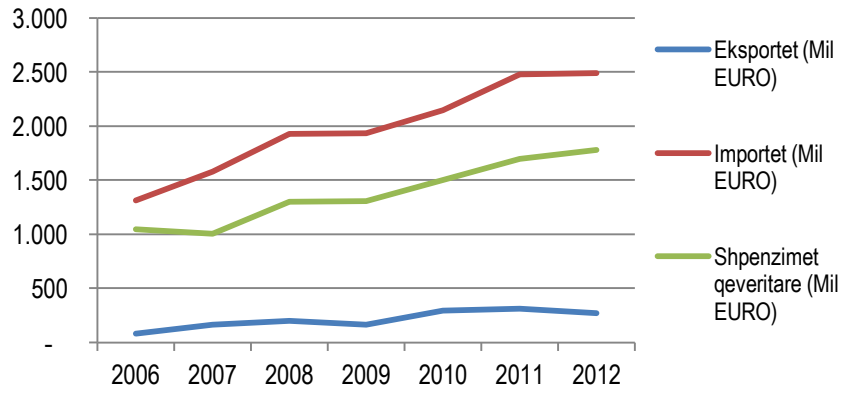
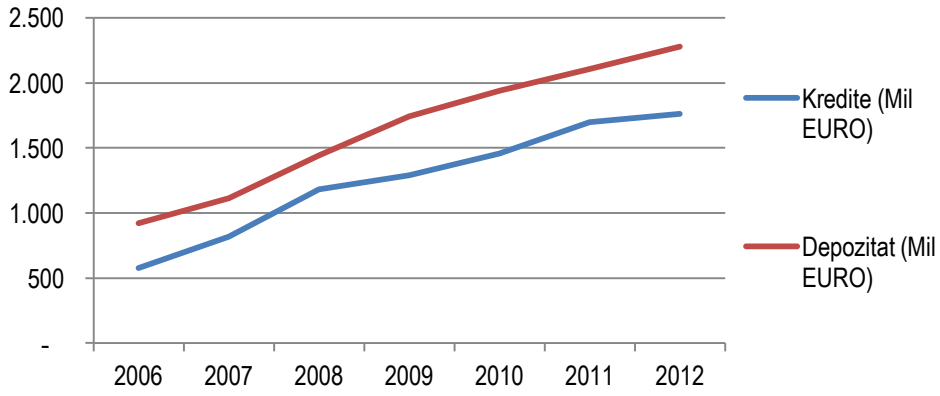
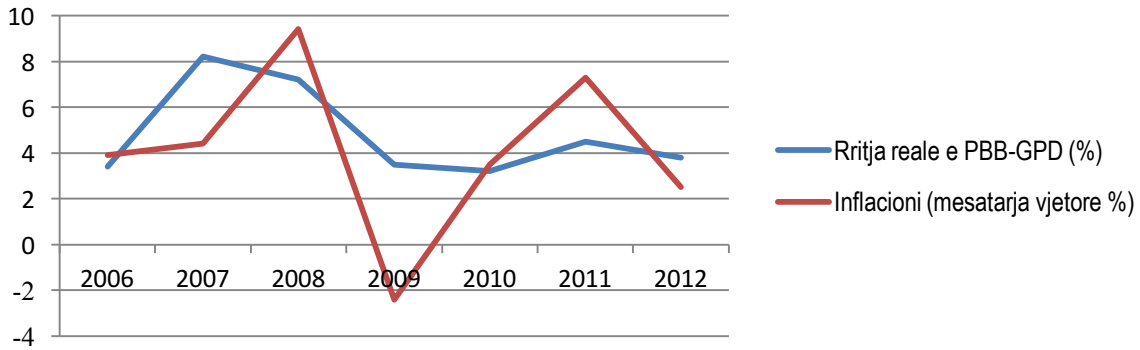


Figure 1 - Trends in key economic indicators during the period 2006-2012 in Kosovo





Regarding the economic environment, the real growth of gross domestic product (GDP) shows that Kosovo's economy has suffered economic decline, particularly after the year 2007. The main factors in the downturn of economic growth are the decrease in exports, increased imports, the decline in foreign direct investment and in remittances. But the growth in spending and continued investment in the public sector (Table 1, Figure 1) have had a positive impact on economic growth during the analyzed period and reducing the impact of the global financial crisis. Compared with the economies of the region, Kosovo's economy is one of the few economies in the region that managed to have a positive growth rate during the global economic crisis. This can be confirmed by the trend of figure 1, where the real growth rate of GDP during 2006-2012 has been positive. Also, this trend is confirmed by the growth of deposits and loans, compared with the region where only Kosovo and Albania in the year 2009, have increased loans and deposits (Table 2).

Table 2 - Growth rate of loans and deposits in 2009 (%)

	Republic of Kosova	Bosnia & Herzegovina	Croatia	Montenegro	Albania	Macedonia
Credits/Loans	13.2	-1.4	-0.5	-9.9	12.1	14.5
Deposits	17.3	-7.6	-0.3	-18.3	58	-0.3

Source: Financial Bulletin no. 10, 2010, the Central Bank of Kosovo.

However, as a result of improper performance of the economy during the global financial crisis, banks were more conservative in Kosovo and this caused a reduction of lending to the economy, even though the trend of lending continued to be positive. However, increases in government spending (table 1) during this period managed to reduce to some extent the negative effects of the crisis on the Kosovo's economy.

2. Literature review

In this section, we have presented the prior literature used in the performance of commercial banks in the various countries which we have taken as a basis for analysing the performance of commercial banks in the Republic of Kosovo.

Measuring the bank performance in general and commercial banks in particular has been the subject of much research in recent years conducted by many famous authors. Most of the research conducted by these

authors is empirical research of the commercial bank performance in various countries of the world (see Quey-Jen Yeh 1996, Grigorian 2002, Oral and Yolalan 1990, Bonin 2005, Demirgüç-Kunt 1999, Web 2003). However, with the introduction of the global financial crisis of 2008 and the collapse of many well-known global financial institutions, the number of research conducted by professors, industry analysts, independent researchers, in connection with investigations of the bank performance has been increase to a large extent.

As part of CAMEL system bank regulators (central banks) have applied financial ratios to evaluate the performance of banks. Empirical evidence about the application of financial ratios to evaluate the bank performance, is included in the research of these authors: Beaver (1966), Altman (1968), Maishanu (2004) and Mous (2005).

Based on the literature review of these authors we can conclude that in general there are two general approaches to measuring the performance of banks. The first approach is based on accounting data, or by applying key financial rations of the banks, while the second approach is based on econometric techniques. According to the well-known author Ncube (2009), from the time aspect perspective, the first approach was mostly used, which is based on the use of financial analysis of performance of banks. However, the limitations of this approach along with advancements and the latest techniques of research, have contributed to the development of several alternative methods such as (i) Analysis of Non-Parametric Data Development (DEA) and (ii) Stochastic Frontier Analysis (SFA).

The authors Humphery and Berger (1997) confirm that the purpose of measuring the bank performance is to divided banks which have good performance from those that have poor performed. They point out that "assessing the performance of financial institutions can serve as information for developing state policies, assessing the effects of deregulation, mergers and market structure in efficiency. According to the author Casu (2006) bank regulators *(i.e*. Central Bank of Kosovo), monitor banks by analysing the liquidity, solvency and their overall performance in order to have the information necessary to intervene or prevent the problem appearance. At the most basic level, the bank performance measurement can help to improve performance management, identify best and worst practices and low and high efficiency.

To increase their performance, banks compare their performance with their competitors' performance and assess their performance trends over a period of time. In his research, Tarawneh (2006), has measured the performance of commercial banks of Oman's by using financial rations and has ranked the bank based on their performance. This research has applied financial ratios to investigate the impact of asset management, operational efficiency and size of the banks in the performance of commercial banks of Oman. The findings of this research highlighted the performance of banks is positively influenced by operational efficiency, asset management and the size of banks.

Authors Gulf and Salkhan (2004) investigated the performance of seven commercial banks of Denmark during the period 1994-2001. Financial coefficients are applied to assess the quality of loans, profitability and liquidity. The authors applied students t-test to measure the weight (significance) of statistical performance of these measures. Results showed that the tested commercial banks are relatively less profit-making, liquid and are more exposed to credit risk in comparison with the total Danish banking industry.

Known author Kiyota (2009) conducted a two-phase research to investigate efficiency of profitability and cost of commercial banks of 29 African countries during the period 2000-2007. This research has applied SFA approach, to evaluate the efficiency of profitability and costs, and financial ratios and Tobit regression to provide evidence of inter-state performance and efficiency of commercial banks in Africa. The findings of this research suggest that foreign banks tend to have better performance compared to local banks in terms of performance efficiency as well as cost efficiency. This result was confirmed by the author Kirkpatrick (2007) who investigated the performance of commercial banks of 89 African countries during the period from 1992 to 1999 and showed that banks on average are 67% efficient in terms of profit and 80% efficient in terms of costs.

Oberholzer and Vandedr Westhuizen (2004) investigated the efficiency and profitability of 10 regional banks of one of the largest banks of Ireland. This research demonstrated how traditional analysis of profitability and efficiency can be applied together with the DEA analysis. Although their study concentrates in certain regions, their findings confirm those of author Yeh (1996) that the results of DEA analysis are connected with the efficiency coefficients to the profit trend and efficiency. The conclusion was that there is a strong relationship between traditional measures of profitability and efficiency and allocations and costs.

The above research is focused on the branches of a single bank, and a study author Cronje (2007) included the whole banking sector (13 banks) of South Africa which through analysis of financial rations analyzed the effectiveness of South African banks. His findings show that 13 banks, three biggest banks are efficient and serve as a standard for other banks classified as ineffective. Overall, seven banks were classified as ineffective and

author has provided recommendations for the banks to improve their efficiency. Recommendations included specific instructions for ineffective bank employees which can implement to increase the sustainability of profitability. Results of this research do not correspond with the research conducted in the UK by the authors Drake (2001) and Webb (2003), which identified the major banks were less efficient. This difference can be attributed to changes in the operating environment of the banks in these countries. South Africa is evolving economy while the UK is a developed country.

3. Research methods and assumptions

This research was conducted by applying descriptive analysis of financial rations, to explain and investigate the performance of commercial banks in the banking sector of the Republic of Kosovo during the period of seven years (2006, 2007, 2008, 2009, 2010, 2011 and 2012). Data for this research were secondary data and are obtained from annual reports of commercial banks for seven years of financial reporting periods. All the data are expressed in monetary value, in Euro, and are obtained from the website of the Central Bank of Kosovo (CBK).

Except for classical analysis of bank performance for the seven reporting years analyzed, this research focuses also on investigating whether or not commercial banks of Kosovo are affected by the global financial crisis of year 2008. To make this analysis possible, the financial data of banks have been split into two aggregate groups. The first group includes the years 2006-2007, before the introduction of the global financial crisis, while the second group includes the years 2008-2009 during the financial crisis. To see if there is a statistically significant difference in the performance of banks during 2006-2007 (group 1) compared to 2008-2009 (group 2), this research applies students t-test. T-test is applied to test the hypothesis that the average of these two periods are the same for all the variables used in this research.

The hypothesis in our case is null hypothesis and it is interpreted through the following equation:

H 0: μ 1 = μ 2

Alternative hypothesis is represented through the following equation.

H 1: μ 1 ≠ μ 2

The formula for the t-test is presented as follows:

$$T = \frac{\overline{X} - \overline{Y}}{S_d / \sqrt{n}}$$

The symbol 'μ1' represents the average of all variables for the period 2006-2007, while 'μ2' represents the average of all variables for the period 2008-2009. The testing of hypothesis was performed using SPSS statistical software and through statistical analysis of critical values, such as 'T' value and the 'P' value of statistical significance. The level of reliability, respectively coefficient 'α' applied during this test was 5%. If the value 'P' ≤ 'α', then we should reject the null hypothesis and accept the alternative hypothesis. If the value 'P'> 'α', then the null hypothesis should be accepted and alternative hypothesis should be rejected. *To justify the existence of the financial crisis in the banking sector in Kosovo test results must be such that the null hypothesis is rejected.*

We have applied financial ratios as a method for analysis of bank performance because (i) majority of research in this field were conducted by using similar method, and (ii) the fact that no similar research has been conducted for the banking sector in Kosovo (period 2006-2012). The main advantage of this method is the ability and effectiveness in distinguishing between high-performance banks from other banks. Another advantage is that this method eliminates the risk of non-comparability. Advantages and disadvantages of each bank can also be identified through financial ratios by calculating the following category of ratios: profitability, liquidity and credit quality. Although often accounting records may be subject to manipulation or fraud, for this research, we consider that this risk is eliminated because all financial statements have been audited by international licensed audit firms.

The population of this research consists of all commercial banks which have operated in the banking market during the period analyzed (2006-2012). The sample includes all commercial banks operating in Kosovo, except for those which have started operating (new banks) during or after 2008, which is considered the year of introduction of the global financial crisis. Commercial banks analyzed in this research are: ProCredit Bank (PCB), Raiffeisen Bank Kosovo (RBKO), the Bank for Business (BPB), Economic Bank (EB) Nova Lubljanska Banka (NLB). Excluded from the sample banks are: National Trade Bank Kosovo Branch (BKT), Turkish Economy Bank (TEB) and Ish Bankasi. Their inclusion would cause inconsistencies in statistical analysis of analyzing the financial crisis in the banking sector in Kosovo.

3.1. The research variables

3.1.1. Profitability

One of the best ways for measuring the performance of commercial banks is profitability analysis. According to best practices, leading ratios for measuring the profitability are:

- *Return on assets (ROA[18]) - net profit / total assets.* This ratio indicates how much profit is generated for every € 1 net assets of the bank. The higher the ROA, the more valuable is the bank. In short, this coefficient shows how well the bank's assets are managed in order to increase its profit.
- *Return on equity (ROE[19]) - net profit / total equity.* From the bank's perspective, this ratio is the best indicator of profitability and growth potential. It represents the rate of return to shareholders of the bank, or the percentage of profit for every € 1 invested in the bank.
- *Cost to income ratio (C/I[20]) - the total costs / total revenues.* From the bank's perspective, this ratio shows how costly it is for the bank to produce a unit of output (revenue, profit). the lower the ratio the higher the performance of the bank.

3.1.2. Liquidity

Liquidity is the ability of the bank to pay its financial obligations in a timely and effective manner. According to the author Samad (2004) liquidity *'presents the life and blood of commercial bank*'. According to best practices, leading ratios for measuring the liquidity are:

- *Liquid assets to deposits-borrowings (LADB[21]) - liquid assets / customer deposits and short-term borrowed funds.* From the perspective of the bank this ratio indicates the number of liquid assets available to depositors and other lenders.
- *Net loans to total assets (NLTA[22]) - Net loans / total assets.* This ratio measures the percentage of assets that are blocked in the form of loans. The higher this ratio, the lower the liquidity of the bank.
- *Net loans to deposits-borrowings (NLDBR[23]) - net loans / customer deposits and short-term borrowed funds.* This ratio measures the percentage of total deposits frozen in the form of non-liquid assets (loans). The higher this ratio, the lower the liquidity of the bank.

3.1.3. Credit quality

Based on conservative principle, all banks expect to have bad loans in their credit activity, however, one of the main objectives of banks is to minimize such losses. Credit performance (credit quality) assesses the risk associated with the asset portfolio of the bank, *i.e.*, the quality of loans issued. According to best practices, leading ratios for measuring the credit quality are:

(i) Loan loss provision to gross loans (LLPGL[24]) – loan loss provision / gross loans. This ratio measures the quality of bank loans. The higher this ratio, the more problematic are bank loans.

4. Results of survey

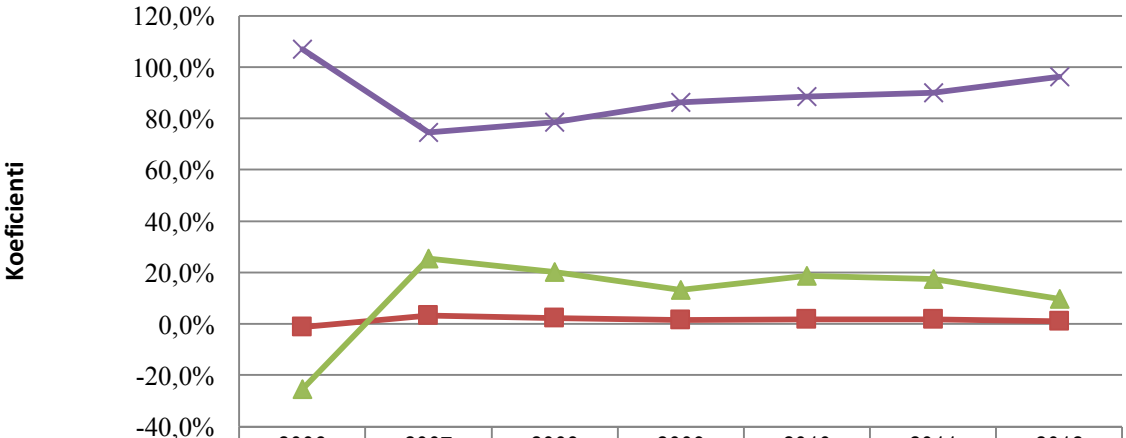
4.1. The research variables

4.1.1. Profitability

The concept of risk and return is quite present in the banking industry. Enterprise risk means higher profits. According to a study conducted by the auditing company *KPMG (1998),* the granting loans with higher margins, to customers with high risk, can increase profits (in short), but it increases the credit risk of the bank and potential losses in the future.

Figure 1 shows the profitability performance of the banking sector during the period 2006-2012. Profitability is measured by *ROA, ROE and Cost to Income (C / I)* which are explained in the prior section.

[18] Return on Assets (ROA).
[19] Return on Equity (ROA).
[20] Cost to Income (C/I).
[21] Liquid Assets to Deposit-Borrowing Ratio (LADBR).
[22] Net Loans to Total Assets (NLTA).
[23] Net Loans to Deposits-Borrowings Ratio (NLDBR).
[24] Anglisht: Loan Loss Provision to Gross Loans (LLPGL).



	2006	2007	2008	2009	2010	2011	2012
Mesatarja ROA	-1,1%	3,3%	2,3%	1,5%	1,8%	1,7%	1,0%
Mesatarja ROE	-25,4%	25,5%	20,2%	13,2%	18,8%	17,4%	9,7%
Mesatarja C/I	107,1%	74,6%	78,6%	86,3%	88,6%	90,1%	96,3%

Figure 2 - Profitability trend during the period 2006-2012

Figure 1 shows an increase trend of profitability from 2006 to 2007. ROA increased from - 1.1% to 3.3%, while during 2008-2012 has continued to fall at a slower trend, reaching 1.0% in 2012. ROE increased from -25.4% to 25.5%, while during 2008-2012 has continued to fall at a slower trend, reaching 9.7% in 2012. The main reason for the profitability growth during the period 2006-2007is as a result of growth in total assets of the banking sector, mainly the due to the increase in the item 'loans to customers'.

Analysis 2008-2009

Slowdown of the banking sector reflected directly in the profitability of commercial banks during 2008-2009. Compared to 2008, net profit of the banking sector in 2009, registered a decline of 37.7 percent, reaching the value of 18.3 million euro. The profit decline was mainly due to the reduction in the growth rate of revenues of commercial banks. The reduction of profit represents the main contributor to the reduction of overall profitability of the banking sector in Kosovo, expressed through ROE indicator which for 2009 decreased significantly compared to the previous year, recording a level of 20.2%. Although the main contributor to the decline of profitability during 2008-2009 was the reduction in interest income, in addition to that, the decrease of LIBRO rate in the European market caused decrease of revenues from placements abroad. Reducing the profitof the banking sector shows negative implications for the level of efficiency in this sector. In this context, the average return on assets (ROA) of the banking sector for 2009 decreased to 1.5 percent (from 2.3 percent in 2008) that can be interpreted as lower efficiency of the banking system to realize profits from use of available assets.

Analysis 2010-2011-2012

The fall of the profitability indicators during 2011, compared to 2010 were due to the fact that banking system reported net profit worth 14.9 million euros, which is 13% lower than in 2010. Reduction of net profit was mainly a result of faster growth in expenses compared to revenues of the banking system. This can be explained by the trend of costs to income (C / I) presented in Figure 1, where it can be observed a constant increase from 2008 to 2012. This ratio was 74% in 2008 and rose above 90% in 2012.

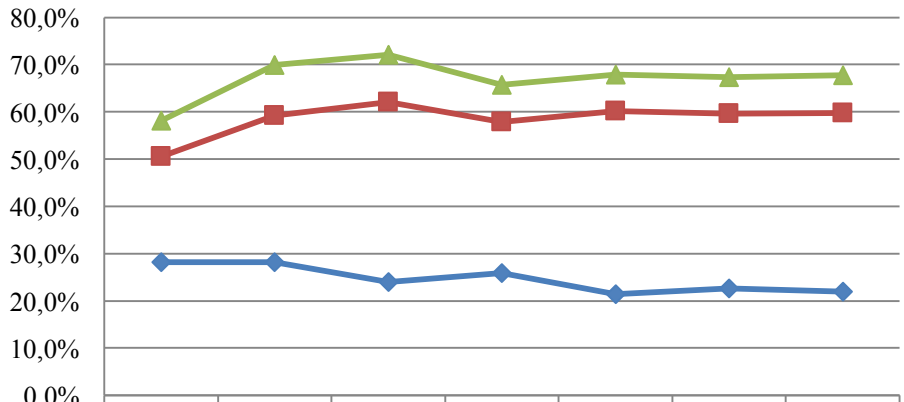
During 2012, Kosovo's banking system reported profit of 10.2 million euros, which is 31.2% lower compared to the year 2011. Reduction of net profit was mainly a result of faster growth in expenses compared to revenues of the banking system. See the trend C / I in Figure 1. Reduction of net profit in 2012 was also reflected in the deterioration of the profitability indicators of the banking system (ROA, ROE, C / I). In year 2012 ROA declined, falling to 1.0 percent compared to 1.7 percent in 2011. It was characterized by a decline of ROE rate, which fell to 9.7 percent compared with 17.4 percent in year 2011. Faster growth in expenses compared to revenues in the domestic banking system has also led to the deterioration of efficiency indicators for the banking system. The ratio of expenses/revenues rose 96% in 2012 from 90% in 2011.

4.1.2. Liquidity

With the introduction of the 'sub-prime' credit crisis in the US, the effects began to be distributed globaly and that increased the credit risk. This uncertainty made financial market participants, including banks more risk averse, and the level of investment in these markets was significantly reduced. This fact contributed to the reduction of the level of liquidity in global financial markets.

Kosovo, could not be fully immune to these events with international dimensions and this is reflected in the profitability, liquidity and credit quality ratios. Liquidity of banks in Kosovo, consists of customer deposits (current accounts, savings accounts and time deposits accounts) and balances with the Central Bank of Kosovo (CBK) for the purpose of maintaining liquidity. These banks must hold reserves at the CBK for the purpose of maintaining liquidity. Such reserves are calculated as 10% of average monthly deposits of bank customers with maturities up to one year, for the previous month.

Figure 2 shows the trend of net loans to total assets (NLTA), net loans to deposits and borrowings (NLDBR) and liquid assets to deposits and borrowings.



	2006	2007	2008	2009	2010	2011	2012
Mesatarja LADBR	28,2%	28,2%	24,1%	25,9%	21,5%	22,6%	21,9%
Mestarja NLTA	50,6%	59,2%	62,1%	57,8%	60,1%	59,6%	59,8%
Mesatarja NLDBR	58,1%	69,9%	72,1%	65,8%	67,9%	67,4%	67,8%

Figure 3 - Liquidity trends during the period 2006-2012

Although the rate of net loans to total assets (NLTA) is not a direct measure of liquidity, it shows to whatextent the bank's assets are blocked in the form of non-liquid assets ('loans'). As it can be observed from 2006 to 2008 there is a growth trend of this ratio, while from 2009 to 2012 we have a constant ration of 59% to 60%. In general, a NLTA may present liquidity problems for banks during times of financial crisis, however, a small increase in this ratio did not present any problem for banks in Kosovo, since they could have access to reserves in CBK which have been above the minimum required.

LADBR coefficient has declined steadily during the examined period 2006-2012, and it has reduced the liquidity of banks. This ratio has decreased from 28.2% in 2006 to 21.9% in 2012 which shows a decrease in the amount of funds available in case of unexpected with drawals. Although the percentage of liquid assets in banks has increased, which mainly consist of accounts and balances with CBK and other banks, customer deposits and other funding sources increased by agreater percentage, that has influenced that this trend show reduced levels of liquidity.

NLDBR ratio also had the same growth trend during the period 2006-2012, increasing from 58.1% in year 2006 to 67.8% in year 2012. This growth trend implies increased damage to banks' liquidity, as more bank assets, customer deposits and other funding sources are being blocked in the form of loans which are classified as non-liquid assets. Liquidity of banks is mostly contracted during 2007-2008 and 2009-2010.

Strengthening of the liquidity position in 2009 can be seen from the participation of liquid assets to total sources of financing in 2009 which was 26% compared with 24% in the previous year. This can be supported by the NLTA ratio, which shows that the level of loans in year 2009 decreased compared to deposits and other bank borrowings. The increase of commercial bank liquidity, except for reduction in the issuance of loans may also have been as a result of the planned withdrawal of deposits by Post and Telecom of Kosovo which during 2009 have been transferred to the Government in the form of dividends.

It can be concluded that despite the turmoil in the international financial sector, all banks operating in Kosovo have enjoyed satisfactory liquidity position throughout the period of the evolution of the global financial crisis. Based on the Statistical Bulletin no. 10 issued by Central Bank of Kosovo, satisfactory liquid position of the banking sector is also evidence through analysis of the results generated through stress-test 'where banks appeared capable to liquidate their liabilities *in the event of higher rates of deposit withdrawals'.*

4.1.3. Credit quality

Credit quality and performance is related to the level of risk associated with the loan portfolio of commercial banks. Figure 3 presents the trend of loan loss reserve to gross loans during the examined period 2008-2012.

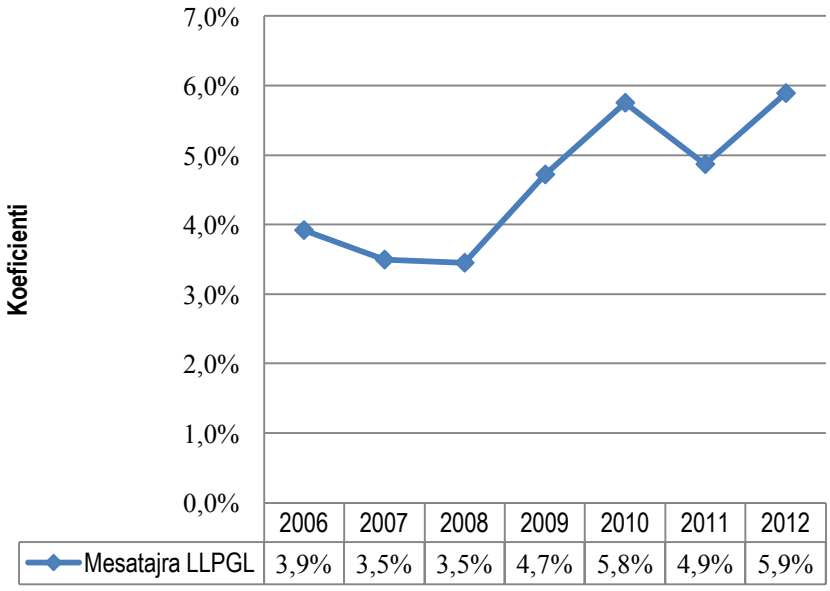


Figure 4 - Credit quality trends during the period 2006-2012

Figure 4 shows a stable trend of loan loss reserve to gross loans during the years 2006, 2007 and 2008. However, years 2008, 2009 and 2012 indicate an impairment of the credit quality of the banking sector in Kosovo. Improvement of this ratio during 2011 was a result of continued growth in the level of loans originated and declining level of non-performing loans.

From 2008 until 2009 and 2010, non-performing loans increased from 3.5% to 4.7% and 5.8%. This may have been due to the impact of the global financial crisis and the difficult market environment in Kosovo. This happened due to the fact that banks were more exposed to increased credit risk, because the loans with the highest risk, which were issued during 2005-2006, have begun to deteriorate, and as a result, the bank had to report higher provisions for potential losses from these loans.

In general, although the appetite of banks for profits have been adjusted in line with the circumstances and the economic environment, the operating environment of the banking sector continued to be under pressure in 2009 and beyond, as evidenced by increases in reserves for loan loss provision and the fall of the profitability levels. This resulted in the impairment of quality of the loan portfolio of commercial banks of Kosovo during 2008-2012.

4.2. Hypothesis testing

To examine whether the difference of the performance of banks during the period 2006-2007 is statistically different from that during the period 2008-2009, the Student t-test was applied to test the hypothesis whether the averages of these two periods are the same for seven variables discussed and analyzed above. The following table presents the results of the t-test-for the two periods analyzed.

Table 1 - Results of the t-test (2006-2007, 2008-2009)

	1. Profitability			2. Liquidity			3.Credit quality
	ROA	ROE	C / I	LADBR	NLTA	NLDBR	LLPGL
2006-2007 (average)	1.122%	17:49%	80.33%	28.22%	54.89%	64.01%	3.70%

2008-2009 (average)	1.787%	16.74%	82.44%	24.98%	59.96%	68.93%	4:09%
'P' value	0.4677	0.7630	0.4658	0.4433	0.1615	0.1843	0.4192
Alfa	00:05	00:05	00:05	00:05	00:05	00:05	00:05
The decision on the hypothesis	Accepted	Accepted	Accepted	Accepted	Accepted	Accepted	Accepted

Source: authors own calculation

As far as profitability is concerned, ROA shows that banks have performed better during 2008-2009 than during 2006-2007, while in terms of ROE and C/I, the banks have performed poorly over the period 2008-2009 compared the period 2006-2007. As presented in Table 1, the average ROA for the period 2006-2007 was 1.122% compared to 1.787% for the period 2008-2009. ROE shows another trend, with an average of 17.49% during the period 2006-2007 compared to 16.74% during the period 2008-2008. The average C/I ratio during the pre-crisis period was 80.33% and 82.44% during the crisis. All this shows that banks have had better performance of profitability before the global financial crisis than during the global financial crisis (2008-2009).' P' values of ROA, ROE and C / I ratios are 0.4677, 0.7670 and 0.4658, therefore the difference between the performance of profitability for these two periods (before the crisis and during the crisis)is not significant statistically, since 'P' values are greater than 'alpha' 0.05(confidence level). According to these values, *the null hypothesis should be accepted* and this means that profitability is not deteriorated and the financial crisis has not had a material impact on the banking sector.

Liquidity levels have fallen as a result of the financial crisis. The average liquidity ratios of LADBR, NLTA, NLDBR during the period 2006-2007 were more favorable in comparison with the period 2008-2009. However, the null hypothesis of equality during these two periods cannot be rejected because "P" values are 0.443, 0.1615 and 0.1843. This means that statistically, there is no significant difference between the performance of banks' liquidity during these two periods.

Regarding the quality of loans, the average loan loss reserve to gross loans was 3.70% during the period 2006-2007 and 4.09% for 2008-2009, noting that the loan portfolio has deteriorated during the crisis. However, this difference is not statistically significant because the "P" value of this ratio is 0542. Therefore, the null hypothesis cannot be rejected.

From the results of students t-test, it can be argued that despite the appearance of the global financial crisis and their effects on the economies of many countries in the world, in the banking sector of Kosovo it is not observed any distinction or statistically significant difference, between pre-crisis period 2006-2007 and during the crisis period 2008-2009. Therefore, we can conclude there was no statistically significant difference between the performance of liquidity, profitability and credit quality during the period 2006-2007 and 2008-2009.

This result can be justified by the fact that commercial banks in Kosovo have not had any direct exposure to the 'sub-prime' credit markets, while branches of international banks have had very limited exposure.

Summary and conclusions

In this paper, we measured the performance of commercial banks in Kosovo during the period 2006-2012 and we have statistically tested the level of impact of the global financial crisis in 2008 on these banks. The results showed that on average, profitability, liquidity and credit quality has been improved over during 2006-2008 and from 2008 began to deteriorate.

It is also concluded that there was no statistically significant difference in the bank's performance during the period 2006-2007 compared with 2008-2009. Such a result may have been due to the fact that Kosovo is faced with the global financial crisis in a good macro/fiscal position allowing less sensitive effects.

We can conclude that, despite the appearance of disorder and crisis in global financial markets during 2008-2009, the banking sector in Kosovo has remained stable. Banks have continued to meet all regulatory requirements regarding capital adequacy and liquidity acceptable level. Also, it can be emphasized that banks have remained in stable position and protected from the storm of the global financial crisis, as they have benefited from limited exposure to foreign company securities and due to the fact that the crisis assets have been minimal on the balance sheets of commercial banks of Kosovo.

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APPENDIX

- T-test results

T-test results: ROA

	2006-2007	2008-2009
Average	1.122%	1.787%
Variance	0.00036975	5.44124E-05
Occasions	5	5
Pearson coefficient	0.283796029	
	0	
Df	4	
t Statistics	-0.801482289	
P (T <= t) two-tailed	0.467760531	
t Critical two-tailed	2.776445105	

T-test results: ROE

	2006-2007	2008-2009
average	17:49%	16.74%
variance	0.014506122	0.012361255
occasions	5	5
Pearson coefficient	0.902151263	
	0	
Df	4	
t Statistics	0.322793436	
P (T <= t) two-tailed	0.763020346	
t Critical two-tailed	2.776445105	

T-test results: C / I

	2006-2007	2008-2009
average	80.33%	82.44%
variance	0.054544431	0.002510086
occasions	5	5
Pearson coefficient	0.098959107	
	0	
Df	4	
t Statistics	0.805206446	
P (T <= t) two-tailed	0.46583881	
t Critical two-tailed	2.776445105	

T-test results: LADBR

	2006-2007	2008-2009
average	28.22%	24.98%
variance	0.033269937	0.013733054
occasions	5	5
Pearson coefficient	0.928441373	
	0	
Df	4	
t Statistics	0.849627559	
P (T <= t) two-tailed	0.443394003	
t Critical two-tailed	2.776445105	

T-test results: NLTA

	2006-2007	2008-2009
average	54.89%	59.96%
variance	0.003609096	0.001450871
occasions	5	5
Pearson coefficient	0.150229592	
	0	
Df	4	
t Statistics	-1.71486537	
P (T <= t) two-tailed	0.16151793	
t Critical two-tailed	2.776445105	

T-test results: NLDBR

	2006-2007	2008-2009
average	64.01%	68.93%
variance	0.003343	0.001463568
occasions	5	5
Pearson coefficient	0.019067	
	0	
df	4	
t Statistics	-1.60227	
P (T <= t) two-tailed	0.184355	
t Critical two-tailed	2.776445	

T-test results: LLPGL

	2006-2007	2008-2009
average	3.70%	4:09%
variance	6.77829E-05	0.000119625
occasions	5	5
Pearson coefficient	0.53846953	
	0	
df	4	
t Statistics	-0.89957154	
P (T <= t) two-tailed	0.419208215	
t Critical two-tailed	2.776445105	

Differentiation of Regions of the Russian Federation as to Level of Budget Revenue Potential of Municipal Entities

Nakhapu A. IBRAGIMOVA
North-Caucasus Federal University, Russia
nahapu-raifu@rambler.ru

Lyudmila N. PANKOVA
North-Caucasus Federal University, Russia
ludmilaganshina@rambler.ru

Valentina N. PARAKHINA
North-Caucasus Federal University, Russia
v-parahina@mail.ru

Svetlana N. KALYUGINA
North-Caucasus Federal University, Russia
s.kalyugina@gmail.com

Gelani I. KHANALIEV
Grozny State Oil Technical University, Russia
hgis@mail.ru

Abstract

The article deals with the notion "budget revenue potential" of region. Potential of local budgets in the regions of the RF is analyzed and transfer-dependent model of economic behavior of municipal regions is determined – for revenues from own production and financial and commercial activities of municipal entities are very low, and budget revenues are too centralized.

The significance of financial stability of municipal entities for provision of socio-economic development of region is emphasized. It is shown that financial state of municipalities is determined by the mechanisms of leveling of budget provision on the basis of inter-budget transfers, their perfection and objectivity. The main problem of local administration is determined – chronic deficit of financial assets for current needs and development of municipal entity, which is peculiar for most countries. For the purpose of complex characteristics of budget of the subject of the Russian Federation and its economic potential, it is offered to calculate such indicators as the level of tax provision, independence, and transfer dependence of budget. Direct dependence of effectiveness of territorial budgets on the level of decentralization of the budget process is shown. The conclusion is made on significance of fiscal decentralization in the system of management of state and municipal finances. Experience of Stavropol Krai in regulation of budget relations and increase of effectiveness of budget expenditures is provided.

Keywords: budget relations, budget process, subsidized budget, inter-budget transfer, tax system, tax revenues.

JEL Classification: H72. R51.

1. Introduction

With Russia's transition to market foundations of economy, revenues began to be formed mainly from tax revenues, which meant their transition to the legal basis, regulated by the law. At present, revenues from own production and financial and commercial activities of municipal entities do not exceed 10% of all revenues, which means that the rest 90% of revenues are received by municipal entities due tax revenues and financial help from other budgets (Kuryan 2014).

State and municipal finances are ties which connect the integrated economic environment of a federative state, which is expressed in centralization and constant flow of financial assets in the process of distribution of tax revenues between the levels of budget system and distribution of tax revenues of above budgets between budgets of lower levels (Benito *et al.* 2015, Hansen *et al*. 2014, Chernyavsky and Vartapetov 2004).

In Russia, this mechanism is pre-determined by the Federal laws. The Federal Law No. 131-FZ"On general principles of organization of local government in the RF" (Articles 55-59) sets that norms of allocations from federal taxes, equal for the level of budget system, are set by the Budget Code (Federal Law No. 131-FZ), which increases predictability and sustainability of tax revenues of budgets of all levels. Regional taxes (Article 14 of the Budget Code of the RF) include: transport tax, tax on gambling, corporate property tax (Tax Code of the RF). Revenues

from regional taxes and collections are transferred into local budget by rates set by the subjects of the Russian Federation on the basis of the Tax and Budget Codes of the Russian Federation.

The federal laws set local taxes which are levied on the whole territory of the RF. Specific size of tax rates are set by the legal acts of representative bodies of municipal entities. The Article 15 of the Tax Code of the RF assigns the following taxes to local taxes: land tax, personal property tax (Tax Code of the RF).

Local administration has a legal right for establishment, change, and cancel of local taxes and fees. The mechanism of norms of tax liabilities allows redistributing assets by means of local budgets into regional budgets. That's why the government of the RF aims at development of the country in direction of more just redistribution of budget assets between the levels of budgets of the RF. Realization of this task requires the totality of financial and economic indicators which provide adequate evaluation of budget potential of the territory.

Research methodology

During the research, the authors use the methods of comparative analysis of notions, statistical methods of evaluation of budget revenue of potential territory, and modeling of behavior of budgets of municipal authorities during aggravation of economic situation.

Indicator of budget revenue of potential territory and its evaluation

The level of municipality's provision with financial assets is related to the value of budget revenue of potential territory (Blore, Devas and Slater 2004). The notion "budget revenue potential" of region could be treated as totality of tax and non-tax revenues of budget and capability of covering of expenditure obligations with these revenues.

According to the above, budget revenue potential of region is a result of ratio of tax and non-tax revenues to expenditures of budgetof corresponding level and could be expressed with the following formula (1).

$$BRP_i = (R_{taxi} + R_{n/taxi}/E_{liabi} \quad (1)$$

where: BRP_i – budget revenue potential of region, R_{tax}– tax revenues of regional budget, $R_{n/tax}$ – non-tax revenues of regional budget, E_{liab} – expenditure liabilities of regional budget

The indicator of budget revenue of territory's potential is closely connected to indicators of budget provision. The Budget Code of the Russian Federation treats the level of budget provision of region (municipal region, city district) as ratio if the index of tax potential to index of budget expenditures.

$$LBP_i = ITP_i / IBE_i \quad (2)$$

where: ITP_i– index of tax potential of region, IBE_i– index of budget expenditures of region.

Tax potential is totality of revenues which could be acquired into the budget of corresponding level (municipal entities) from tax sources assigned to this level of the budget level. The index of tax potential of municipal entities could be defined as ratio of tax potential of municipal entities per capita to the similar indicator on average for all municipal entities of the region, in the following way:

$$ITP_i = (TP_i / N_{pi}) / (SUM\ (TP_i) / SUM\ (N_{pi})) \quad (3)$$

where: TP_i – evaluation of tax potential of municipal entities, N_{pi}– number of permanent population of municipal entities, $SUM\ (TP_i)$ – total tax potential of all municipal entities of the region, $SUM\ (N_{pi})$ – total number of region's population.

At this stage of development of the budget process, the laws of the Russian Federation do not have a single methodology of determination of indicators for evaluation of the level of budget provision.

Besides, under the current conditions, municipal entities sometimes introduce corrections into indicators set by the subject of the RF. Such situation often leads to problems and disagreements during development of the project of budget for a fiscal year and planned period (Cabannes 2015). Based on the idea of dependence of strategic goals on the stage of life cycle of socio-economic system (Parakhina and Pankova 2012, Marlowe 2013, Vicente *et al*. 2013), we deem it possible to suppose that the dominating stage – as to totality of region's enterprises – will pre-determine economic behavior of local authorities which form local budget.

Index of budget expenditures is how greater or lesser – per capita – the budget's expenditures are for solving the local tasks. During calculation of this indicator, it is necessary to take into account various factors and conditions which influence the cost of provided budget services – socio-economic, climatic, geographical, and other factors (Holcombe and Williams 2008).

According to provisions of Article 136 of the Budget Code of the RF, the level of freedom in making and realization of decisions of local administration bodies depends on the share of inter-budget transfers (subsidies) in the volume of own revenues of the local budget. Depending on the share in local budgets of inter-budget transfers from budgets of other levels (excluding subventions) and/or tax revenues for additional norms within two of three last studied fiscal years, municipal entities are divided into (Budget Code of the RF): independent (less than 10 %), subsidized (10 - 29 %), medium subsidized (30 - 69 %), highly subsidized (70 % and more).

These crisis economic phenomena led to the situation when inter-budget relations, which were not in the favor of local administration, stimulated official growth of the number of deficit regions.

Subsidies for local budgets

Modern Russian economic science offers various definitions of subsidies and, accordingly, various methodologies for its evaluation.

According to Rodionova (1997), subsidized are "regional and local authorities which – due to existing conditions – are not provided with assets sufficient for performance of their authorities", *i.e*., they cannot perform the functions set on them by the Constitution and laws without financial support. The generally accepted criterion of true financial independence of the region is own revenues of regional budgets.

Tax and non-tax revenues of local budget are a resource of development of municipal entities (Shah 2007). In the RF, a significant share of local budget revenues belongs – together with tax and non-tax revenues – to transfers between budgets of various levels of the budget system of the country.

The share of transfers between budgets (without subventions) in own revenues of budgets of municipalities in view of the federal districts of the Russian Federation for 2012 and 2013 is shown in Table 1.

Table 1 – Share of inter-budget transfers (without subventions) in own revenues of local budgets in view of the federal districts of the Russian Federation for 2012 and 2013, % (Ministry of Finance of the RF)

Federal district	2012	2013
1. Central FD	35.3	34.9
2. North-Western FD	44.1	43.8
3. Southern FD	40.1	38.2
4. North-Caucasus FD	57.1	56.5
4. Volga FD	45.5	45.2
5. Ural	53.6	49.9
6. Siberian FD	49.3	49.0
7. Far Eastern FD	58.3	63.1

In 39 regions of the Russian Federation, total volume of transfers between budgets of various levels exceeded the average value for the country, and in 44 regions it was lower than the average level for the RF in 2013. The largest sum of transfers into local budgets accounts for the following regions: Sakhalin Oblast–78.3%; Chukotka Autonomous District –76.3%; Republic of Dagestan–73.8%; Amur Oblast–72.6%; Nenets Autonomous District–72.0%; Tyumen Oblast–71.9%.

Budgets of city districts and communities were subsidized by 38.1% and 17.0% in 2012; in 2013 – by 38.3% and 16.9%, accordingly. The main reasons of the current ratio are low tax revenues in revenues of municipal budgets and responsibility for financing of local administration for leveling budget provision of communities, which influences the allocation of help from regional funds of financial support of municipalities (Ministry of Finance of the RF).

The mechanism of norms of tax liabilities allows performing redistribution of assets by means of local budgets into regional budgets. This allows using higher potential of cities which become donors for other regions-subsidizers. This mechanism often leads to a situation when revenues of city budget may reduce with growth of tax potential. At that, the share of subsidies in budgets of subjects is rather high, being a consequence of significant centralization of financial assets.

The task of provision of financial independence and sustainability of functioning of municipalities is the issue of revenues of local budgets (Lyuta *et al*. 2015). At that, the structure of budget revenues of municipal entities is very important, as it allows understanding which part of assets the municipality can use independently and what is potential of these revenues. At present, the main problem of local administration is chronic deficit of financial assets for current needs, let alone development of municipal entities. At that, it should be noted that this problem is not peculiar only for Russia – it is present in all countries of the world (Shah (Ed.) 2007, Marlowe 2013, Rego *et al*.

2015). The structure of revenues of budgets of municipal entities of various types in dynamics for 2012 – 2013 is shown in Table 2.

Table 2– Structure of revenues of budgets of municipal entities in subjects of the RF which fully formed budgets of communities in 2012 -2013.

Indicator	2012		2013	
	billion RUB	share, %	billion RUB	share, %
	City districts			
Tax revenues	268.0	37.2	370.3	37.6
Non-tax revenues	90.7	12.6	136.9	13.9
Uncompensated receipts	341.3	47.4	448.3	45.5
Revenues from entrepreneurial activities	20.5	2.8	29.2	3.0
Total revenues	720.5	100	984.7	100
	Municipal districts			
Tax revenues	147.4	24.1	174.5	21.2
Non-tax revenues	21.2	3.5	45.2	5.5
Uncompensated receipts	433.8	70.9	587.7	71.4
Revenues from entrepreneurial activities	9.3	1.5	15.2	1.9
Total revenues	611.7	100	822.6	100
	Communities			
Tax revenues	20.2	22.7	31.5	23.1
Non-tax revenues	9.4	10.5	11.5	8.4
Uncompensated receipts	58.2	65.4	92.5	67.7
Revenues from entrepreneurial activities	1.2	1.4	1.2	0.9
Total revenues	89.0	100	136.8	100

Study of the above data allows seeing the general structure of revenue basis of municipal entities, performing analysis of a particular structure, and evaluating their dependence on transfers between budgets of various levels. Information on revenue part of budgets of municipal entities for 2012-2013, which is shown in Table 2, allows seeing that the most well-balanced budgets of the subjects of the RF are budgets of city districts.

When studying the structure of own revenues for 2013 according to types of municipal entities, it is possible to see that own revenues in budgets of city districts and city municipal entities constitute 50.3% of their total volume; in budgets of municipal districts – 35.5%; in budgets of communities – 14.2%.

Tax revenues account for 42.7 % in the total volume of own revenues. In 39 subjects of the Russian Federation, this indicator exceeded the above average value, and in 44 subjects of the Russian Federation it was lower than this value. Maximum and minimum values of the given indicator in view of subjects of the Russian Federation are shown in Table 3.

Table 3 – Maximum and minimum values of shares of tax revenues of local budgets in 2013 (Decision of the Board of the Accounts Chamber of the RF)

Subjects of the RF with the largest share of tax revenues of local budgets in own revenues	%	Subjects of the RF with the smallest share of tax revenues of local budgets in own revenues	%
St. Petersburg	77.0	Nenets Autonomous District	11.6
Moscow	65.9	Sakhalin Oblast	19.1
Moscow Oblast	62.3	Chukotka Autonomous District	21.3
Vologda Oblast	58.2	Amur Oblast	22.3
Lipetsk Oblast	57.7	Republic of Dagestan	22.5
Kaluga Oblast	57.6	Tyumen Oblast	23.3
PrimorskyKrai	56.9	Republic of Sakha (Yakutia)	25.6
Kursk Oblast	54.1	Republic of Tyva	27.2
Republic of Adygea	53.2	Yamalo-Nenets Autonomous District	30.2
Kabardino-Balkar Republic	53.2	Republic of Ingushetia	31.4

As there is a significant scatter in socio-economic development of municipal entities, distribution of tax revenues according to types of municipalities is performed unevenly: budgets of city districts accumulate 60.3% of tax revenues; budgets of municipal districts accumulate 28.4% of tax revenues; budgets of communities accumulate 11.3% of tax revenues.

The main budget revenue tax in 2013 was the individual income tax. Its share in tax revenues of municipal budgets reaches 69.9% (in 2012 – 70.2%). The plan for tax revenies in 2013 was fulfilled for all municipalities and for main types of taxes (Table 4).

Table 4 – Fulfillment of plans of tax revenues, including for main types of taxes, in 2013 (billion RUB) (Decree of the Board of the Accounts Chamber of the RF)

Types of revenues	plan	fact	% of fulfillment
City districts			
Tax revenues, total	597.9	629.0	105.2
including: Individual property tax	12.4	13.2	106.5
Land tax	84.4	90.8	107.6
personal income tax	399.9	422.3	105.6
Municipal districts			
Tax revenues, total	276.5	296.5	107.2
including: Individual property tax	-	-	-
Land tax	0	0.1	100.0
personal income tax	228.9	247.5	108.1
Communities			
Tax revenues, total	102.5	117.2	114.3
including: Individual property tax	6.1	6.6	108.2
Land tax	39.2	46.9	119.6
personal income tax	53.7	59.2	110.2
Total			
Tax revenues, total	976.8	1,042.7	106.7
including: Individual property tax	18.5	19.8	107.0
Land tax	123.7	137.8	111.4
personal income tax	682.4	729.0	106.8

Non-tax revenues for 2013 were distributed unevenly among municipalities, which is shown by the data in Table 5 (Decree of the Board of the Accounts Chamber of the RF).

Table 5 – Distribution of particular types of non-tax revenues for types of municipal entities in 2013 (billion RUB)

INDICATOR	City districts		Municipal districts		Communities		TOTAL
	Sum	% in total volume	Sum	% in total volume	Sum	% in total volume	
Revenues from using municipal property	95.4	63.6%	31.2	20.8%	23.5	15.6%	150.1
	55.9%		47.2%		62.0%		52.8%
Payments for using natural resources	4.8	40.3%	7.1	59.7%	-	-	11.9
	2.8%		10.7%		-		4.3%
Revenues from paid services and compensations of state expenses	8.1	48.2%	7.2	42.9%	1.5	8.9%	16.8
	4.7%		10.9%		4.0%		5.9%
Revenues from selling material and non-material assets	44.9	64.4%	13.8	19.8%	11.0	15.8%	69.7
	26.2%		20.9%		29.0%		27.3%
Other non-tax revenues	17.8	67.1%	6.8	25.7%	1.9	7.2%	26.5
	10.4%		10.3%		5.0%		9.7%
Total non-tax revenues	171.0	62.2%	66.1	24.0%	37.9	13.8%	275.0 100%

According to analysis of accounting data, provided by municipalities, revenues from municipal property account for the largest share (52.8%) of non-tax revenues. The share of this type of revenue in total sum of non-

tax revenues of city districts equals 55.9%, municipal districts – 47.2%, and communities – 62.0 % (Data of statistical tax reports…, www).

Analysis of the structure of revenues of municipal districts' budgets shows that dependence of budgets of municipal districts on uncompensated receipts from above-ranking budgets in 2012-2013 was the highest, constituting more than 70% of the total volume of their revenues (Lyan 2015).

It is possible to state that municipal reform in Russia established a model of transfer-depending municipal district – with high level of dependence both from subsidies for leveling of budget provision and additional norms of tax payments and from subventions during execution of liabilities delegated by the state. Another troubling tendency is reduction of share of tax revenues in the structure of revenues of district budgets.

The share of inter-budget transfers in the structure of revenues of budgets of urban and rural settlements could be compared to the share of transfers in revenues of municipal regions, constituting 65% of the total volume of budget revenues of settlements in 2012-2013. Analysis of the structure of budget revenues of settlements in dynamics for 2012-2013 shows that settlements in the Russian Federation are highly dependent on transfers, while tax and non-tax revenues have a secondary role in pumping up budgets of settlements, constituting less than 1/3 of the total volume of their budget revenues.

Differentiation of budget revenues of municipal entities

It should be noted that budget revenues are strongly differentiated depending on types of municipal entities (city districts, municipal districts, communities). There is a large gap between provision with own revenues of city districts, on the one hand, and of municipal districts and communities, on the other hand.

Thus, in the structure of budget revenues the uncompensated receipts constituted: in city districts – 45.5%, communities – 67.7%, districts – 71.4%. In our opinion, this distribution is a consequence of not so much of the level of revenue sources as of territory's characteristics. Thus, city districts and communities have a certain budget autonomy, but municipal districts turn into additions to regional authorities and do not have own assets for development (Parakhina, Boris and Midler 2015).

The growth of non-tax revenues is observed: in municipal districts+113.2%, in city districts+50.94%, in communities +22.34% (Data of statistical tax reports…, www). So, it could be concluded that districts have concentrated the most liquid property and use it for pumping up their budgets, but settlements do not have such an opportunity. The growth of uncompensated receipts, despite real differences in revenue base, constitutes: in settlements +58.93, in city districts+31.35%, in municipal districts +35.48% (Data of statistical tax reports…, www).

A recent tendency has been reduction with municipal entities of own revenues against the background of constant growth of the number of issues of municipal significance as a result of amendments implemented by the laws during the time of action of the Federal law "On local government".

According to the combined statistical tax reports as of May 1, 2014 (last available data), the share of tax revenues, fees, and other mandatory payments into consolidated budget of the Russian Federation is distributed in the following way: revenues of the Federal Budget– 45.8%, revenues of the budgets of subjects of the RF– 47.6%, revenues of local budgets– 6.6%.

Thus, most of resources are collected at the federal and regional levels. At that, as compared to the data at the beginning of 2013 (54%, 37.7%, 8.3%) (Kuryan 2014), we see positive dynamics for regional indicator with corresponding reduction of the share of revenues into the federal and local budgets. Reduction of federal revenues in favor of regional revenues is necessary due to certain decentralization of main directions of activities of public authorities – in particular, it concerns large expenditures for education, healthcare, social policy, etc. at the regional level. At that, while comparing the change of regional and local revenues, it is possible to see that before inter-budget transfers there is significant redistribution in favor of regional budget, as well as negative dynamics for the share of allocations into local budget. This dynamic is caused by the passing of the Federal law dated July 23, 2013 No. 252 "Regarding amendments into the Budget Code of the Russian Federation and some laws of the Russian Federation", according to which the rates of allocations of personal income tax into regional and local budgets changed from 80% and 20% to 85% and 15%, accordingly.

Expenditures of local budgets. Evaluation of chances of execution of local budgets

Budget expenditures are performed on the basis of expenditure powers and liabilities of municipalities, *i.e.,* they are determined by rights and liabilities of public authorities within their competence. The list of laws, contracts, and agreements which supposes appearance of expenditure liabilities, subject to execution by means of local budget, forms the list of expenditure liabilities.

Based on reports for 2013, total expenditures of local budgets constituted RUB 3,428.9 billion, which is by 8.3% higher than in 2012. Expenditures for solving the issues of local importance grew by 9.4%, or RUB 212.8 billion – as compared to 2012 – constituting RUB 2,485.1 billion. This type of expenditures constituted 72.5% of the total sum of expenditures of municipalities in the RF on the whole.

Table 6 – Structure of expenditures of local budgets in view of authorities and issues in 2013 (%)

Federal Districts	Expenditures for solving issues of local level	Expenditures for execution of state authorities	Expenditures for solving issues which are not of local level
Russian Federation	72.5	16.5	11.0
Central Federal District	73.4	14.5	12.1
Northwestern Federal District	72.9	11.4	15.7
Southern Federal District	69.7	18.7	11.6
North Caucasian Federal District	54.5	37.0	8.5
Volga Federal District	74.3	19.3	6.4
Ural Federal District	73.3	7.0	19.7
Siberian Federal District	70.2	17.0	12.8
Far Eastern Federal District	80.7	11.0	8.3

Expenditures for realization of state authorities in 2013 constituted 16.5% of the total volume of expenditures. For all federal districts, this structure of municipal expenditures is preserved, except for budgets of the subjects of North Caucasian Federal District, where expenditures for solving the issues of local importance constitute 54.5%, and for performance of state authorities – 37.0 % (Decree of the Board of the Accounts Chamber of the RF…, www).

The main criterion of execution of local budgets is number of obligations of municipal budgets – they include: credit debt of budget establishments, debt obligations of municipalities. The list of subjects of the RF with maximal and minimal size of debt obligations of municipalities as of January 1, 2014 is given in Table 7 (Decree of the Board of the Accounts Chamber of the RF…, www). The main sum of credit debt accounts for municipal budgets of Tatarstan, Krasnodar Krai, Moscow Oblast, and Novosibirsk Oblast.

Irreducible level of expenditures shows that municipalities do not fulfill the task for optimization of their expenditures. There are no evaluation and division into effective, poorly performing, and ineffective budget expenditures. There is no refusal from budget financing of the latter. One of the main tasks of budget reforming is not realized.

Table 7 – List of subjects of the Russian Federation with maximum and minimum size of debt obligations of municipalities as of January 1, 2014 (million RUB)

Subjects of the RF with the largest volume of debt	% of own revenues of local budgets	Volume of debt	Subjects of the RF with minimum municipal debt	% of own revenues of local	Volume of debt
Republic of Tatarstan (Tatarstan)	49.7	30,845.5	Kurgan Oblast	0	0.8
Krasnodar Krai	20.8	18,369.8	Nenets Autonomous District	0.1	8.0
Moscow Oblast	8.3	13,891.9	Tyumen Oblast	0.1	79.6
Novosibirsk Oblast	20.3	13,119.5	Republic of Kalmykia	3.1	85.1
Samara Oblast	20.7	10,690.2	Karachay-Cherkess Republic	2.8	128.6
Voronezh Oblast	26.5	9,474.1	Kabardino-Balkar Republic	3.5	165.6
Republic of Bashkortostan	14.6	9,124.5	Jewish Autonomous Oblast	7.9	277.1
Kaliningrad Oblast	35.5	8,478.1	Republic of Khakassia	5.2	423.9
Volgograd Oblast	24.3	7,585.0	Chukotka Autonomous District	5.3	462.0
Saratov Oblast	23.2	6,629.4	Perm Krai	1.0	565.3

In current realia, constant under financing of municipalities and targeted character of assets that are allocated from higher budgets means that quality of budget expenditures of municipalities does not grow (Institute of modern development…, www). Certain positive dynamics has been observed since 2012 in part of transition to leveling of budget provision instead of evening out the level of coverage of factual expenditures. The main characteristics of the budget of Stavropol Krai for 2014 and the planned period of 2015-2016 are shown in Table 8.

Table 8 – Main characteristics of the budget of Stavropol Krai for 2014 and the planned period of 2015-2016 (million RUB)

	2014 project	2015 project	2016 project
Revenues	67,450.7	72,421.4	76,468.8
Expenditures	74,129.8	79,494.4	84,033.8
Including conventionally set	-	1,899.9	3,831.3
Deficit/proficit	-6,689.1	-7,073.0	-7,565.0

According to the forecast, with the growth of total volume of revenues (the growth will constitute 13.4%), expenditures will also grow (supposed growth by 2016 – 13.4%), and the deficit of the krai's budget will grow as well. On average, differentiation of budget provision between ten most and 10 least provided municipal entities of Stavropol Krai after distribution of donation for leveling of budget provision from the krai funds constituted, due to objective reasons: for 2010 – 20.6 times, 2011 – 23.9 times, 2012 – 2.9 times, and 2013–2014 – 3 times. Such substantial reduction of differentiation of the level of budget provision for 2012 after distribution of donation from the krai budget – as compared to similar indicators for 2011 – was possible as a result of implementing amendments into the Law of Stavropol Krai "Regarding inter-budget relations in Stavropol Krai".

The implemented changes suppose division of a subsidy for leveling of budget provision of settlements into 2 parts: one part is distributed for all municipal entities of the settlement level (including city districts) on the basis of population, and the other part is given to settlements (excluding city districts) on the basis of budget provision. As a result, after distribution of subsidy for leveling of budget provision from the krai fund, revenues per capita in municipal entities of settlement type grew substantially.

Indicators of consolidated budget of Stavropol Krai, as compared to indicators of subjects of North Caucasian Federal District and for the RF on the whole, are given in Table 9. The data given in the Table 9 allows concluding that with the general positive dynamics, values of revenues and share of the indicator per capita for Stavropol Krai, our region is in rearguard – as compared to other subjects of the North Caucasian Federal District and the RF on the whole.

The given main characteristics of the republican budget bring us to the conclusion regarding the expected growth of general volume of revenues (11.9% as to the level of 2013). Expenditures will grow faster – despite the fact that 2015 – as compared to 2014 – will have certain reduction of expenditures, and their growth in 2015 – as compared to the 2013 level – will constitute 23.8%.

Uneven dynamics of expenditures is caused by the fact that planning of budget is performed on program-targeted principle and depends on which programs and in which volume will be realized in corresponding calendar period (Anopchenko and Murzin 2014).

Table 9 – Comparative indicators of consolidated budget of Stavropol Krai for subjects of the North Caucasian Federal District and the Russian Federation

INDICATOR	Stavropol Krai		Average indicators for subjects of the NCFD		Average indicators for subjects of the RF	
	2012	2013	2012	2013	2012	2013
Population, thousand people	2,787.03	2,790.79	9,492.91	9,540.76	143,056.38	143,347.06
REVENUES total, mil.RUB	84,901.72	91,963.22	331,838.55	372,743.32	8,060 853.13	8,197 976.01
Budget revenues per capita, RUB/citizen	30,463.15	32,952.46	34,956.47	39,068.52	56,347.39	57,189.70
Subsidies set by federal laws and international agreements for regional and local taxes, mil. RUB	2,522.70	2,407.16	4,847.16	4,625.17	285,192.08	272,130.28
Subsidies set by regional laws local authorities, mil. RUB	492.6	715.02	2,052.9	2,979.8	175,355.56	254,528.59
EXPENDITURES total, million RUB	91,579.96	99,614.06	338,355.51	389,970.07	8,339,480.20	8,837,832.81
Expenditures per capita, RUB/citizen	32,859.34	35,693.92	35,642.97	40,874.12	58,295.06	61,653.39

Evaluation of the level of budget provision of subjects of the North Caucasian Federal District (NCFD)

Table 10 shows the data of the Ministry of Finance of the RF on planned budget provision of a range of subjects of the RF for 2014 - 2016, calculated according to the methodology of distribution of subsidies for leveling the budget provision of subjects (Ministry of Finance of the RF, www).

Table 10 – Level of planned budget provision of the subject of the NCFD

Subject of the Russian Federation	Level of expected budget provision for 2014	Level of expected budget provision for 2015	Level of expected budget provision for 2016
Republic of Dagestan	0.633	0.602	0.592
Republic of Ingushetia	0.603	0.558	0.576
Kabardino-Balkar Republic	0.651	0.630	0.610
Karachay-Cherkess Republic	0.645	0.613	0.598
Republic of North Ossetia	0.648	0.623	0.605
Chechen Republic	0.623	0.583	0.586
Stavropol Krai	0.695	0.698	0.644

At that, the highest level of expected budget provision in 2014 constitutes: 2.585 (Moscow); 2.509 (Tyumen Oblast); 2.269 (Yamalo-Nenets AO). The lowest level of expected budget provision: 0.570 (Chukotka AO); 0.603 (Republic Ingushetia).

The data of the Ministry of Finance of the Russian Federation allows concluding on reduction of the level of expected budget provision for all subjects of the NCFD, including Stavropol Krai (which has the highest level of expected budget provision), ad well as the Republic of Ingushetia and the Chechen Republic, as subjects with lower level of indicator (Figure 1).

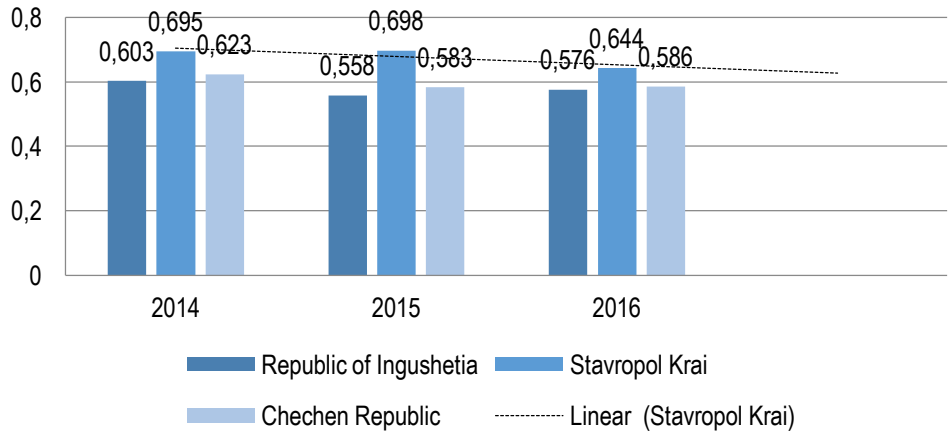

Figure 1 – Expected values of the level of budget provision in regions of NCFD in 2014-2016

Based on the fact that indicator of budget revenue of territory's potential is closely related to indicator of budget provision, it is possible to make a conclusion regarding the comparable reduction in the planned period. Table 10 shows the data of the Ministry of Finance of the RF on provision of expenditures of regions of the Russian Federation with own revenues. According to a wide spread opinion, this indicator characterizes the value of budget revenue of region's potential.

Table 10 – Provision of expenditures with own revenues of consolidated budgets of the subjects of the RF, %

Subjects of the RF	2012	2013	2014
RUSSIAN FEDERATION	86.35	83.49	87.17
CENTRAL FD	90.90	88.75	90.04
NORTH-WESTERN FD	88.59	87.04	88.30
SOUTHERN FD	77.51	76.20	81,57
NCFD	75.41	74.28	79.10
Republic of Dagestan	76.10	67.77	84.01
Republic of Ingushetia	57.58	54.21	61.02
Kabardino-Balkar Republic	73.49	75.71	78.29
Karachay-Cherkes Republic	76.60	68.88	66.88
Republic of North Ossetia (Alania)	80.73	76.22	75.78
Chechen Republic	75.25	87.93	80.78
Stavropol Krai	77.95	78.57	81.45
VOLGA FD	81.66	81.00	82.09
URAL FD	90.65	82.19	94.29
SIBERIAN FD	82.96	78.63	82.04
FAR EASTERN FD	85.60	82.26	90.51

According to the given data, the level of budget revenue potential in North Caucasian Federal District is the lowest – as compared to other regions – 79.1 in 2014, with the average indicator for the Russian Federation being 87.17; the highest potential is observed in Ural Federal District (94.29). The received data conform to other studies on evaluation of economic state of subjects of the NCFD (Parakhina 2012, etc.)

For evaluation of the level of budget revenue potential, the scale shown in Table 11 could be offered.

Table 11 – Scale for evaluation of the level of budget revenue potential

Level of coverage of expenditures of budget with its revenues	Type of budget revenue potential
0.90 <=BRP<= 1	high
0.75 <= BRP<= 0.89	medium
0.5 <=BRP<=0.74	low

Table 12 – Combined indicators of execution of budgets of the subjects of the RF as of January 1, 2015

Subjects of the Russian Federation	Temporary population, thousand people	Revenues, million RUB	Revenues, RUB per capita	Tax and non-tax revenues, million RUB	Uncompensated receipts from other budgets of the budget system of the RF, million RUB	Uncompensated receipts, RUB per capita	Share of uncompensated receipts in revenues, %	Expenditures, million RUB	Expenditures, RUB per capita
Russian Federation	146,270.03	8,743,106.58	59,773.74	7,140,940.87	1,544,784.41	10,561.18	17.67	9,212,135.33	62,980.33
CENTRAL FEDERAL DISTRICT	38,944.84	2,899,921.97	74,462.30	2,598,160.82	304,559.39	7,820.28	10.50	3,015,620.99	77,433.14
NORTH-WESTERN FEDERAL DISTRICT	13,847.17	985,433.56	71,164.98	842,104.07	140,859.95	10,172.47	14.29	1,029,319.61	74,334.29
SOUTHERN FEDERAL DISTRICT		558,850.32		446,626.76	113,096.89		20.24	613,799.52	
NORTH CAUCASIAN FEDERAL DISTRICT	9,659.07	350,009.37	36,236.34	136,990.70	212,670.47	22,017.70	60.76	365,403.99	37,830.14
Republic of Dagestan	2,990.29	89,902.49	30,064.83	26,923.65	63,011.02	21,071.89	70.09	92,469.32	30,923.21
Republic of Ingushetia	463.41	24,471.59	52,807.88	3,302.85	20,940.06	45,187.09	85.57	24,302.76	52,443.55
Kabardino-Balkar Republic	860.81	28,100.34	32,644.14	12,949.88	15,219.40	17,680.37	54.16	30,098.32	34,965.19
Karachay-Cherkes Republic	469.25	18,602.54	39,642.87	6,517.54	11,955.18	25,477.04	64.27	20,782.17	44,287.77
Republic of North Ossetia-Alania	705.24	25,276.16	35,840.72	10,986.20	14,210.79	20,150.40	56.22	27,051.78	38,358.48
Chechen Republic	1,370.17	69,691.95	50,863.61	12,843.49	56,878.69	41,512.05	81.61	71,758.87	52,372.12
Stavropol Krai	2,799.90	93,964.30	33,559.83	63,467.11	30,455.34	10,877.28	32.41	98,940.78	35,337.21
VOLGA FEDERAL DISTRICT	29,717.81	1,308,367.17	44,026.36	1,042,742.35	255,673.92	8,603.39	19.54	1,421,669.67	47,838.97
URAL FEDERAL DISTRICT	12,276.23	955,340.88	77,820.39	850,980.04	76,653.53	6,244.06	8.02	968,623.36	78,902.36
SIBERIAN FEDERAL DISTRICT	19,313.88	980,536.78	50,768.50	729,285.35	242,374.06	12,549.22	24.72	1,072,522.00	55,531.15
FAR EASTERN FEDERAL DISTRICT	6,211.38	704,646.53	113,444.37	494,050.77	198,896,19	32,021.24	28.23	725,176.17	116,749.53

Qualitative characteristics of budgets of the subjects of the Russian Federation

Table 12 contains information which allows determining such characteristics of the budget of the subject of the Russian Federation as the level of tax provision, independence, and transfer dependence of the budget. These characteristics could be considered important components of economic potential of the region which determine its level and tendencies of development (Anopchenko *et al.* 2015).

One of indicators which characterize the structure of budget revenue potential is its tax provision (LBP_{BRP}); it could be calculated in the following way:

$$LTP_{BRP} = R_{tax} / R_{budg} * 100 \quad (3)$$

where: LTP_{BRP} – level of tax provision of budget revenue potential, R_{tax} – volume of tax revenues of budget, R_{budg} – total budget revenues

An important indicator of development of budget revenue potential of regional budget is its independence which could be expressed by the formula:

$$LI_{BRP} = R_{own} / R_{budg} \quad (4)$$

where: LI_{BRP} – level of independence of budget revenue potential, R_{own}– own revenues of budget, R_{budg}– total revenues of budget.

Volume of uncompensated receipt into the budget from other budgets of the budget system of the Russian Federation determines the level of transfer dependence of budget revenue potential:

$$LTD_{BRP} = UR / R_{budg} \quad (5)$$

where: LTD_{BRP} – level of transfer dependence of budget revenuepotential, UR – volume of uncompensated receipts from budgets of other levels.

Estimated values of indicators of independence and transfer dependence of budget revenue potential for the North Caucasian Federal Districts are shown in Table 13.

Table 13 – Indicators of the level of development of budget revenue potential of the subjects of North-Caucasian Federal District

Subject	LI_{BRP}	LTD_{BRP}
RUSSIAN FEDERATION	0.82	0.18
NORTH-CAUCASUS FEDERAL DISTRICT	0.39	0.61
Republic of Dagestan	0.30	0.70
Republic of Ingushetia	0.14	0.86
Kabardino-Balkar Republic	0.46	0.54
Karachay-Cherkes Republic	0.36	0.64
Republic of North Ossetia-Alania	0.44	0.56
Chechen Republic	0.18	0.82
Stavropol Krai	0.68	0.32

The data of Table 13 proves the earlier conclusions on high transfer dependence and insufficient level of independence of budget revenue potential of the subject of the North-Caucasian Federal District. While average indicator of transfer dependence for the Russian Federation constitutes 0.18, in the North-Caucasian Federal District it is 0.61. The highest indicator of transfer dependence within the NCFD is peculiar for the Republic of Ingushetia (0.86) and the Chechen Republic (0.82). Accordingly, these subjects have the lowest indicator of budgets independence.

Conclusions

As a result of the research, a stable tendency of recent years was found – reduction with municipal entities of their own revenues against the background of constant increase of the number of issues of municipalsignificance.

There is constant under financing of municipalities and targeted character of assets allocated from higher budgets, which means aggravation of quality of budget expenditures of municipalities which do not deem it necessary and possible to optimize their expenditures. Actually, it is possible to state that as a result of the municipal reform in Russia, there appeared a model of transfer dependent municipal district with the high level of dependence

on subsidies. In order to improve this situation, it is recommended to divide budget expenditures into effective, poorly performing, and ineffective with mandatory refusal from budget financing of the latter.

Measures for budget saving cannot solve the problem of growth of budget revenue potential in the North-Caucasian Federal District which has the lowest level, as compared to other levels, though there has been certain positive dynamics since 2012 in part of transition to leveling of budget provision instead of leveling of the level of coverage of actual expenditures.

Significant reduction of differentiation of the level of budget provision in recent years (starting from 2012) is observed in Stavropol Krai, where distribution of subsidies from the krai budget lead to differentiation of budget provision between 10 most and 10 least provided municipal entities of the krai reducing by 7 times.

It was found that city districts have certain budget autonomy, and municipal districts are turning into addition for regional authorities – they do not have their own assets for development, as tax and non-tax revenues constitute less than 1/3 of total volume of their budget revenues.

Therefore, the main budget problem of local authorities in Russia (and other countries of the world) is chronic deficit of financial assets even for current needs, let alone development of municipal entities. At that, solution of this problem lies beyond the authorities of local administration, as their arsenal has a limited number of strategic tools of influence on the volume of revenues and expenditure powers.

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The Short- and Long-Term Relationship between Input and Output in the Turkish Automotive Sector

Halim TATLI
Faculty of Economics and Administrative Sciences
Bingöl Üniversity, Turkey
halimtatli@gmail.com

Abstract:

This study aims to discuss the short- and long-term relationship between the input and output variables of the Turkish automotive sector using a production model. This relationship, measured using the data for the period between 1982 and 2014, was analyzed using the ARDL bound test. In the long-term analysis, the effect of the input variables on the output was significant, with the FTP being the most effective on the output. In the short-term analysis, the effect of the input variables on the output variable was found to be significant.

Keywords: automotive sector, total-factor productivity, ARDL

JEL Classification: D22, D24, L25, L62.

1. Introduction

The automotive sector is currently going through a rapid process of innovation under the effect of globalization. This sector is characterized with an effective use of technological developments. These characteristics have a positive effect on the automotive sector in such areas as the production process, distribution of goods, governance, human resources policies and marketing.

The automotive sector, which has a strategic importance for an economy, can be referred to as a driving force for other sectors and overall economic performance in developed and developing countries. This is because the automotive sector tends to make a positive impact on many sectors, given the production of intermediate goods and sales processes. The products of other sectors are used by the automotive sector as intermediate goods in the production process. Thus, the automotive sector receives its intermediate goods mainly from the iron and steel sector, but also from glass, plastic, textile, electronic, petrochemical and IT sectors, and in this way, it affects them. Moreover, it makes positive contribution to the effective functioning and development of the services (distributors, retail, maintenance and repair and insurance activities), construction, tourism, agriculture and transportation sectors. These characteristics indicate that the automotive sector is broader, more diversified and more effective than most other sectors.

The automotive sector is also characterized with intense research and development (R & D) investments and the use of advanced manufacturing techniques. With this feature, it has added positive impact on the economic structure. As a result of intense R & D investments in the sector, the emergence of technological innovations as well as the obtaining of new production information is facilitated.

With its production magnitude, job creation capacity and high share in global trade, the automotive sector is one of the leading economic activities (Automotive Distributors' Association 2013, 11). The two most important characteristics of the sector are the high competitiveness and innovativeness. With these characteristics, it helps the sector's firms develop efficient and effective policies. Other benefits include the increased diversification of products and the acceleration of investments (Ertuğral 2011, 76) (Yaylalı and Çalmaşur 2014, 326). In addition, the automotive sector creates value added in the economy.

Being part of the manufacturing industry, the automotive sector has a considerably important place in Turkey's economy. There are numerous statistics and indicators attesting to the sector's importance. Turkey is the world's 17th largest automotive producer and, as of the end of 2014, is Europe's largest light commercial vehicle producer (Investment Support and Promotion Agency of Turkey 2014, 4). In Turkey's vehicle production, the compound annual growth rate has been approximately 22% for the last 10 years (Abylkassymova *et al*. 2011: 22). The exports by the automotive sector, which is one of the leading exporting sectors of Turkey, rose from $1.593 billion in 2000 to $18.065 billion in 2014 (TurkStat 2015). The automotive sector offers employment opportunities for numerous people in Turkey. The share of the sector's wage earners in the top 500 industrial enterprises was only 3.1% in 1983, but it rose to 13% in 2011 (Ministry of Science, Industry and Technology 2013, 14). Likewise, the total number of the sector's employees rose from 40,838 in 2010 to 43,683 in 2013 (Automobile Manufacturers' Association 2015a, 30). The investments in the sector jumped from TL 551 million in 2010 to TL 1.374 billion in 2014 (Automobile Manufacturers' Association 2015a, 31). In Turkey, the automotive sector attracts a significant

portion of foreign direct investments (Yaylalı and Çalmaşur 2014, 326). The positive developments in the sector continued also in 2015. Indeed, total automotive production rose by 17% in the first 11 months of 2015 compared to the previous year while automotive exports increased by 12% over the same period (Automobile Manufacturers' Association 2015b).

Given these positive effects of the sector on Turkey's economy, it is essential that the sector's total-factor productivity (TFP) should be identified and the short- and long-term relationship between its inputs and outputs should be established. The study first estimated the TFP, which is the rate of the output produced over a certain period to the inputs used in the produced over the same period. In this estimation, the work by Lieberman et al. (1990) as well as Lieberman and Dhawan (2005) was taken into consideration. The estimated TFP and the short- and long-term relationship between capital and labor inputs and the output were estimated using the Autoregressive Distributed Lag (ARDL) Bound Test method. In this context, the Turkish automotive sector was selected as a whole and certain policy proposals were developed for the development of Turkey's automotive sector in the light of the findings from the analysis conducted with the sector's data with an integrated approach. The main objective of the study is to estimate the Turkish automotive sector's TFP econometrically using the sector's data for the period between 1982 and 2014 and analyze the short- and long-term relationship between the sector's inputs and outputs.

In this framework, the study first gives an account of the literature on the subject, and then moves on to describe the data and methodology and finally discusses the analysis findings. In the conclusion section, the findings are assessed and policy proposals are presented.

2. Literature review

An examination of the literature on the subject matter of the study reveals that analysis was previously made using various methods and various variables regarding the relationship between the inputs and outputs of the automotive sector.

There are few studies focusing on the short- and long-term relationship between the input and output of the production process. Some of these studies that were related to productivity in the auto industry were conducted at the factory level. Sáenz-Roy and Salas-Fumás (2014) studied the short- and long-term relationship among the input, labor, capital, output and monthly assembly number in an auto assembly factory. For the self-assessment and internal control of the firm's productivity level and development, the TFP and the growth in the TFP were found to be a reliable measure of the firm's productivity rather than the labor productivity over time. Another factory level study was conducted by Ito (2004), who used the facility-level data for the period between 1988 and 1996. This study sought to identity the differences in productivity between the domestic and foreign facilities in the Thai automotive sector. Production workers per hour value added was used as the output variable while the hours of work by the production workers, the hours of work by non-production workers, the facility size, and the average value of the fixed assets were used as the input variable. The study found that the labor productivity was higher in the facilities operated by foreigners compared to the domestic facilities while the capital efficiency of the facilities operated by foreigners in the motor vehicle body and motor vehicle parts sectors tended to be lower compared to the domestic facilities.

A panel study by Kolasa and Zolkiewski (2004) on the Polish manufacturing industry companies for the period between 1994 and 2001 sought to identify the determinants of the TFP. The technology transfer through imports of high-tech goods into the country, the innovation skills acquired by local entrepreneurs, the transition period reforms and the information and communication technology (ICT) investments were found to have a positive effect on the TFP.

Chang and Robin (2008) investigated the effect of innovation on productivity using the data from 48,794 firms operating in 23 sectors in the Taiwanese manufacturing industry for the period between 1997 and 2003. They used the amount of sales as the output and the capital, labor, energy and intermediate goods used in the production as the input variables. Their analysis found that innovativeness had a significant negative effect on the TFP in all sectors both before and after 1990.

Lee and Jung (2009) conducted an empirical study on the relationship between alternative foreign trade models and the productivity in the automotive industry. Their analysis used the value added as the output variable and the capital consisting of the tangible assets (excluding lands) and the ongoing investment assets as the input variable. The study found the network trade to be more profitable than the private trade and lead to higher productivity.

An empirical study which was carried out in India used the gross value added as the output variable and the capital, labor and innovation scores calculated with a scale as the input variables. The study found that international

firms had a positive impact on the small- and medium-sized firms' access to new technologies and their economic performance (Kumar and Subrahmanya, 2010).

Nandy (2011) utilized the data for the period between 2007 and 2008 to conduct a study on 14 automobile companies in India, employing five variables, namely, the ratio of raw material expenditure to total expenditure, the ratio of labor costs to total costs, and the ratio of sales and management costs to total costs as input variables and the net profit and turnover as the output variables. It was observed that while the input and output oriented models produced different efficiency values, the number of inefficient firms didn't change in both models.

Otsuka and Natsuda (2015) used the panel data analysis method to identify the determinants of the TFP in Malaysia's automotive industry. Their analysis found the sector productivity to be highly dependent on the technology embodied within imports.

An examination of the empirical studies in the literature indicates that the data envelopment analysis (DEA), based on the Malmquist TFP index, was generally used to explain the relationship between the input and output variables. Thus, the DEA, based on the Malmquist TFP, was used by Georganta (1997) to conduct a study on Greece's cereal industry, by Madden and Savage (1999) on the telecommunications sector, by Deliktaş (2002) on Turkey's private sector manufacturing industry, by Managi *et al.* (2006) on oil and natural gas industry in the Mexican gulf, by Yaylacı (2009) on the automotive sectors of 26 developing countries, by Chen (2011) on the automotive sectors of the US, Europe, Japan and North Korea, by Sheng and Song (2013) on China's steel industry, and by Oh *et al*. (2014) on the effectiveness of Korea's manufacturing industry.

In the literature, the studies conducted in Turkey concerning the input and output of the automotive sector were usually analyzed using the DEA. In this context, Yılmaz *et al.* (2002) employed the DEA to analyze the productivity of 10 firms operating in the automotive sector. Net assets, equity capital and number of workers were used as the input and the turnover, profit before tax and exports were taken as the output variable. The study found that the firms which were larger and appeared to be stronger were actually operating inefficiently while the firms which were smaller and appeared to be weaker were more efficient in their operations.

Karaduman (2006) analyzed 17 firms' data for the period between 2001 and 2005 in Turkey using the DEA and Malmquist TFP index method. The study employed the payments for raw materials and the supplier industry and the payments for employees' wages and insurance as the input variables and the internal sales, exports and capacity utilization as the output variables. As a result of the analysis, it was found that the 2001 economic crisis had a negative impact on the automotive industry and the change of effectiveness over time differ from one firm to another.

Yıldız (2006) used the DEA method to estimate the effectiveness and efficiency values of 12 firms operating in Turkey's automotive sector. A two-stage process was adopted in the study. In the first stage, the number of personnel, total assets and paid-in capital were used as the input variables while the amount of sales was used as the output variable. In the second stage, the amount of sales was taken as the input variable while the net term profit was taken as the output variable. The analysis found that no firm attained effectiveness and efficiency simultaneously.

Özdemir and Düzgün (2009) studied the effectiveness of 34 firms which were among the top 500 firms in Turkey taking into consideration the difference in the capital structures. Net assets, equity capital and the number of employees were used as the input variables while the turnover, profit and exports were used the output variables. The analysis found six firms to be effective.

Biçen (2010) used the data from 10 automobile firms for the period between 2005 and 2008 to study five variables including the equity capital, total assets and employment as the input variables and the turnover, net profit and exports as the output variable. The study found five firms to be financially effective and others not effective at various levels. Moreover, no relationship was discovered between the effectiveness level of firms and their capital structure.

Also, Lorcu (2010) studied the data for 14 companies operating in the automotive sector and supplier industries in Turkey for the period between 2003 and 2007 and calculated the total TFP using the Malmquist TFP index method. The number of employees and net assets were used as assets while the profit before tax, exports and gross value added as the output variables. It was found that there were not big losses in the firm's average TFPs, but there were not remarkable improvements in their efficiency increases either during the period of analysis.

Yaylalı and Çalmaşur (2014) analyzed 20 firms' data for the period between 1990 and 2011 in Turkey using the DEA and Malmquist TFP index method. The study employed the payments for raw materials and the supplier industry and the payments for employees as the input variables and the turnover as the output variable. Decrease in the TFP was observed for nine periods and there was increase for other 11 periods.

3. Methodology

3.1. Data set and variables of the study

This study compiled its data from the report titled the "Automotive Industry within Turkey's Top 500 Industrial Enterprises" published by the Automobile Manufacturers' Association (Automobile Manufacturers' Association 2015c). This report contains statistical data belonging to the firms operating in the Turkish automotive sector and supplier industries for the period between 1982 and 2014 as well as assessments related to the data. The automotive sector is one of Turkey's leading sectors and contains firms producing an assorted list of vehicles including tow trucks, trucks, pickup trucks, midibuses, minibuses, automobiles, buses, tractors and defensive vehicles. For the period between 1982 and 2014, there were 37 firms in the main and supplier industries. The consolidated data of all of these firms for the period in question were used in the study.

Series for the gross value added, total equity capital and employment figures of the entire sector for the period between 1982 and 2014 were created for use in the analysis. The variables belonging to these series were combined in a production function. In this production function, the gross value added (Q) is the output variable and the total equity capital (K), the number of people employed (L) and the TFP calculated using Eq. (5) (A) are the input variables.

The output of a sector is generally measured using the concept of value added and differs from the sales. A firm's value added is calculated by subtracting the raw materials, intermediate goods and services bought and the energy used from that firm's total output. The gross value added refers to the factor incomes from a production activity in a workplace as shared by the production factors which take part in the production (Automobile Manufacturers' Association 2015c). In other words, factor revenues include such items as wages and salaries, interests paid and profit in the sense of national income as well as depreciation written up during the year, indirect taxes and depreciation gross value added. As the gross value added figures are expressed in terms of TL and they are not net values even if they are deflated by the GDP deflator, they bear both price and amount effects.

The equity capital data were used as it was impossible to obtain the fixed capital stock and fixed capital investments in the sector. However, the equity data were used to compensate for the lack of data even though equity does not fully represent the capital variable in the production function. Equity is equal to the value obtained by deducing all liabilities from the total assets of a firm (Automobile Manufacturers' Association 2015c). In an effort to remove the price effects, the equity data were deflated with the GDP deflator.

One of the variables which are closely related to the capital stock and output of a sector in general and a firm in particular is employment. The increase in the capital stock leads to a rise in employment, which in turn makes a positive effect on the production amounts of the firms in a sector. In this study, the total number both of production and non-production workers was used to represent the employment input.

The descriptive statistical information about the variables used in the study is given in Table 1.

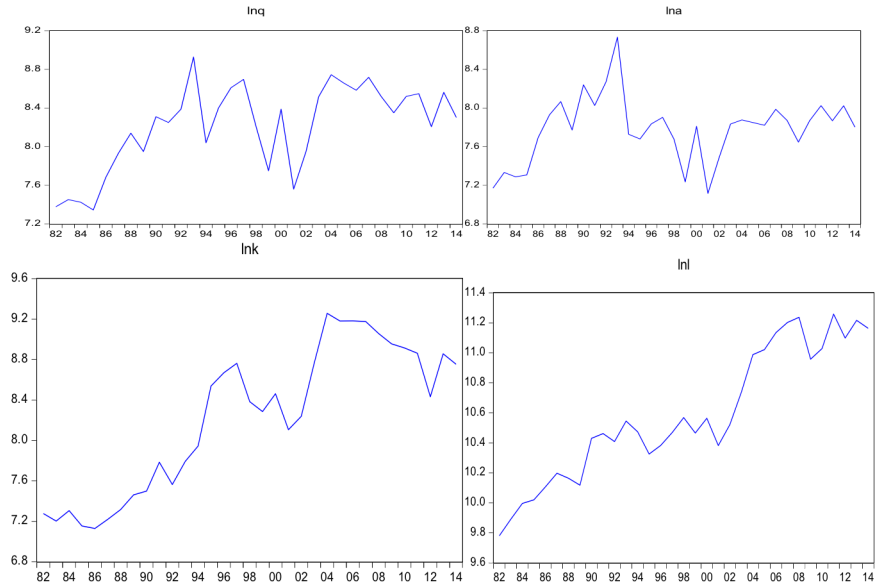
Table 1 - Descriptive Statistics about Variables (1982-2014)

	Mean	Standard deviation
Q*	4019.062	1563.000
K*	4698.117	2959.796
L**	43358.700	18915.00

Source: The data were taken from the report titled the "Automotive Industry within Turkey's Top 500 Industrial Enterprises" published by the Automobile Manufacturers' Association on its website (10.09.2015). Million TL, ** Number of people

Note: Gross value added and equity data were deflated using the real GDP

The charts related to the series of the variables used in the study are shown in Figure 1.



Source: Has been compiled by using E-wievs software.

Figure 1 - The Charts related to the Series of the Variables Used in the Study

As seen in Table 1, the average gross value added of Turkish automotive sector and its supplier industries was approximately TL 4019±1563 million for the period under study while the average equity value was approximately TL 4698±2959.796 million and the average number of employees was approximately 43358±18918 people.

3.2. Study model

The production process of an economy, an industry or a firm is expressed using the production function which is characterized with the production technology. In this scope, a production function is used to define the product factors used in a sector and explain the relationship among them.

A two-stage estimate method was adopted in the study. The first estimation is the econometric calculation of the TFP. To this end, the econometric models used in Lieberman *et al*. (1990), Lieberman and Dhawan (2005), and Sáenz-Roy and Salas-Fumás (2014) were taken as references. The TFP was calculated similarly to Jones (1996). In this framework, a basic Cobb–Douglas production function having the Hicks-neutral technical change can be written as seen in Eq. (1).

$$Q(t)=A(t)K(t)^{\alpha}L(t)^{\beta} \quad (1)$$

In Eq. (1), α and β represent, respectively, the capital and labor flexibility of production while t is the time and A is the TFP. Taking the logarithms of both sides of the equation, we get Eq. (2).

$$LnQ(t)=LnA(t)+\alpha LnK(t)+\beta LnL(t) \quad (2)$$

Taking the TFP as the rate of total output to total input, Eq. (3) is obtained.

$$A(t)=\frac{Q(t)}{K(t)^{\alpha}L(t)^{\beta}} \quad (3)$$

When the logarithms of both sides of Eq. (3) are taken, an econometric model seen in Eq. (4) can be obtained.

$$LnA(t)=LnQ(t)-\alpha LnK(t)-\beta LnL(t) \quad (4)$$

Under the assumption of constant returns to scale, the production function becomes α+β=1. Based on this assumption, replacing β with 1-α in Eq. (4), we get Eq. (5).

$$LnA(t)=LnQ(t)-\alpha LnK(t)-(1-\alpha)LnL(t) \quad (5)$$

In the study, Eq. (2) was estimated using the least squares method under the constant returns to scale assumption. Taking into consideration α and β values in the estimated model, the TFP values were estimated with

Eq. (5) as shown in Solow (1957).[1] The second estimation method used in the study is to investigate the short- and long-term relationship between the outputs and inputs. This relationship was estimated with the econometric model in Eq. (6).

$$Q_t=\beta_0+\beta_1 A_t+\beta_2 K_t+\beta_3 L_t+\varepsilon_t \quad (6)$$

Here, Q is the sector's output amount (gross value added) while A is the TFP value and K is the capital amount (the sector's equity value) and L is the labor amount (the number of people employed in the sector). The econometric model in Eq. (6) was estimated using the ARDL bound test method.

4. Findings

In the section, first, the TFP values were estimated under the constant returns to scale assumption, and then unit root results of all series were given, and finally, the results of the ARDL bound test method were presented.

4.1. Estimation of Total-Factor Productivity

Table 2 presents the results of Eq. (2) estimated using the least square method under the constant returns to scale assumption. Accordingly, capital and labor make significant and positive effect on the output in the automotive sector.

Table 2 - Least squares method estimate under the constant returns to scale assumption (1982-2014)

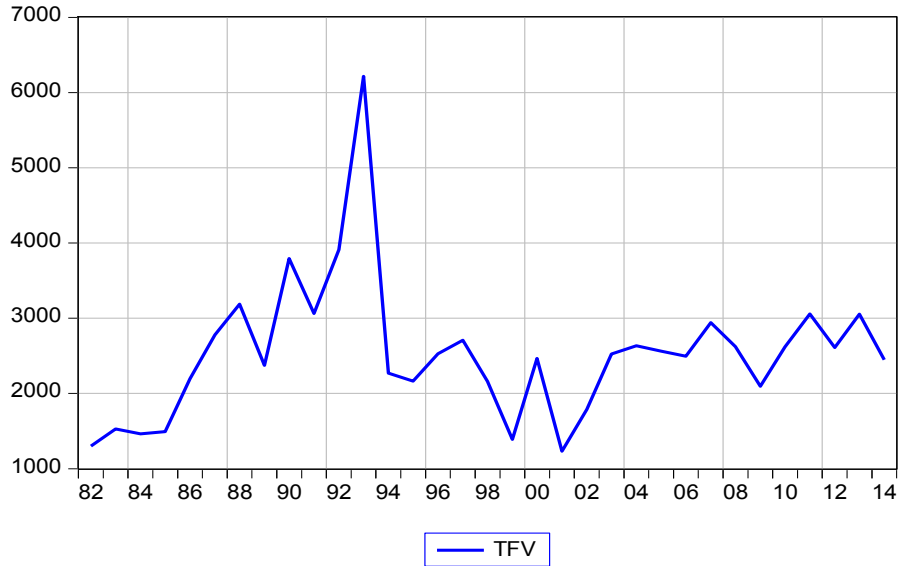
Variable	Coefficient	Standard error	T statistic	P value
Dependent Variable: LnQ				
C	8.593840	0.400918	21.43540	0.0000
LnK	0.585612	0.167666	3.492722	0.0015
LnL	0.414388	0.167666	2.471506	0.0192
R^2	0.282	F statistic	12.1991	
$\bar{R}^2$	0.259	DW	0.852912	

As seen in Table 2, in the Turkish automotive sector, the capital flexibility of the output is approximately 0.59 and the labor flexibility of the output is approximately 0.41. This means that a 1% increase in the amount of capital leads to a 0.59% increase in the amount of production provided that the amount of labor used in the production remains constant. Likewise, a 1% increase in the amount of labor leads to a 0.41% increase in the amount of production provided that the amount of capital used in the production remains constant. Moreover, the growth rate of the constant increase in the TFP was found to be approximately 8.6%.

The capital flexibility of the output and the labor flexibility of the output, estimated in Eq. (2), were used in Eq. (5) to find the TFP values (with logarithms taken). Then inverse logarithms of these TFP values were taken to find the real TFP values. The TFP values, calculated as such, were given in Figure 2.

When the overall total-factor productivity values, given in Figure 2, are examined, we can see that the TFP tended to increase until 1993. However, there was a considerable decline in the TFP in 1994. The most important reason for this is the economic crisis that hit Turkey in 1994. The next biggest decline came in 2000s, again due to another economic crisis. Likewise, the global economic crisis of 2008 caused the TFP values to fall down in 2008 and 2009. The most important conclusion we can derive from Figure 2 is that the TFP levels of the Turkish automotive sector differ from year to year and tend to decline during economic crises.

[1] It is assumed that the coefficients in question were valid during the entire period studied (1982-2014) in the calculation of the capital and labor flexibility of production and total-factor productivity, estimated in Eq.(2).



Source: They were compiled using the EViews program.

Figure 2 - Estimated TFP Values (1982-2014)

4.2. ADF Unit Root Test findings

The ARDL method, used to identify the short- and long-term relationship between the dependent variable Q and the independent variables A, K and L, can be used if the series belonging to the variables are I(0) and I(1). However, this method cannot be employed if the variables are integrated of I(1) or higher order. To examine if the variables are integrated of 1(2) or higher order, Dickey-Fuller (1979, 1981) test and unit root analysis were conducted and the results were given in Table 3.

Table 3 - Unit Root Test results

Variables	Level	First differences	Result
Q (Interrupted and untrended)	-2.978405	-7.989219**	I(1)
A (Interrupted and untrended)	-3.577542*	-	I(0)
K (Interrupted and untrended)	-1.278595	-5.312311**	I(1)
L (Interrupted and untrended)	-3.078679*	-	I(0)

Source: It was created by the author based on the results of the Dickey-Fuller (1979, 1981) test.
Note: * significant at the 5% level of significant **significant at the 1% level of significant

As seen in Table 3, the first difference of the variable Q and K is stationary and the level values of the variables A and L are stationary. This result indicates that the data of the study can be analyzed using the ARDL method.

4.3. Cointegration and Described as an Autoregressive Distributed Lag bound test

The long-term relationship among economic variables is commonly examined using the Engle-Granger (1987) test, which relies on residuals, and Johansen-Juselius (1990) and Johansen (1988, 1991) tests, which rely on maximum similarity. For these tests to be applied, all variables used in the model should be non-stationary at the level and when I(o) and first differences are taken, they should not become stationary (Pesaran et al., 2001: 289-290). The Bound Testing Approach, which is used when variables are I(0) or I(1), but not used when the variables are integrated of I(2) or higher order, has been recently enjoying popularity in the econometric literature. Described as an Autoregressive Distributed Lag (ARDL) approach, this method was developed by Pesaran and Shin (1995), Pesaran and Pesaran (1997), Pesaran and Smith (1998) and Pesaran *et al.* (2001). The short- and long-term relationship between the variables used in the study was examined using the ARDL method.

The first test in this method aims to identify if there a long-term relationship between the variables of the model. Thus, first, an Unrestricted Error Correction Model (UECM) is created. The maximum delay number for the study is set to be 4 as the data were annual. The adaptation of this test, based on the UECM, to the study is given below:

$$\Delta Q_t=\beta_0+\sum_{i=1}^{m}\beta_{1i}\Delta Q_{t-i}+\sum_{i=0}^{m}\beta_{2i}\Delta A_{t-i}+\sum_{i=0}^{m}\beta_{3i}\Delta K_{t-i}+\sum_{i=0}^{m}\beta_{4i}\Delta L_{t-i}+\beta_5 Q_{t-1}+\beta_6 A_{t-1}+\beta_7 K_{t-1}+\beta_8 L_{t-1}+\mu_t \quad (7)$$

In Eq. (7), Δ denotes the first differences. The hypotheses showing if the first period delays of the dependent and independent variables in Eq. (7) are cointegrating are given in Table 4.

Table 4 - Hypotheses of F and t Statistics

	Hypothesis H_0	Hypothesis H_1
F_{III}	H_0: $\beta_5=\beta_6=\beta_7=\beta_8=0$	H_A: $\beta_5\neq\beta_6\neq\beta_7\neq\beta_8\neq0$
t_{III}	H_0: $\beta_5=0$	H_A: $\beta_5\neq0$

The null hypothesis and alternative hypotheses of the untrended model, created to test the cointegration relationship among the variables in Equation are respectively H_0: $\beta_5=\beta_6=\beta_7=\beta_8=0$, H_A: $\beta_5\neq\beta_6\neq\beta_7\neq\beta_8\neq0$. The cointegration relationship among the variables is determined by collectively testing the significance of the coefficients β_5, β_6, β_7 and β_8 in Eq. (7). The existence of cointegration relationship among variables is determined based on a comparison of one lagged level of the calculated F and dependent variable with the critical limit values in Pesaran et al. (2001) with the t statistic. As annual data were used in this study, the model 7 was estimated with maximum 4 lags and without trend. The F statistic results related to the testing of the cointegration relationship are given in Table 5.

Table 5 - Cointegration Test Results

MODEL	m	k	F statistic	I(0) and I(1) Critical Values
				3.65-4.66*
ARDL(1,4,1,0)	4	3	6.280479	2.79-3.67**
				2.37-3.20***

Note: *, ** and *** respectively represent significance levels of 1%, 5% and 10%. Here, m is the maximum number of lags while k is the number of independent variables in the model. The critical values are the values related to the case of k=1, presented in Table CI(iii) in Pesaran *et al.* (2001, 300). The value in parentheses represents p (probability) value of the F statistic.

The F statistic, calculated in Table 5, is greater than the upper critical values at all significance levels. Therefore, the null hypothesis that suggests no long-term cointegration relationship between the total output and the TFP, capital and labor is rejected. Accordingly, we can say that there were long term-term relations between the variables in question for the Turkish automotive sector for the period between 1982 and 2014.

In the next stage that comes after identifying the long-term relationship between the variables, the ARDL model should be estimated in order to analyze the short- and long-term relationship between the variables. The ARDL model, as adapted to this study to analyze the relationship between the variables, is given in Eq. (8).

$$Q_t=\beta_0+\sum_{i=1}^{p}\beta_{1,i}Q_{t-i}+\sum_{i=0}^{q}\beta_{2,i}A_{t-i}+\sum_{i=1}^{q}\beta_{3,i}K_{t-i}+\sum_{i=1}^{q}\beta_{4,i}L_{t-i}+\omega_t \quad (8)$$

To determine the most appropriate ARDL model using the EViews program, Eq. (8) is estimated using the OLS approach for p and q = 1, 2,…, m and i=1, 2,…, and all possible values of k. In this estimation, the maximum lag length (m) was taken as 4. Then, a model is selected using one of the model selection criteria, namely R^2, the Akaike information criterion (AIC), the Schwartz Bayesian criterion (SBC) or the Hannan-Quinn criterion (HQC). The most appropriate ARDL (1,4,1,0) model or Eq. (8) was estimated according to the SBC. The long- and short-term estimation results of the ARDL (1, 4, 1, 0) model in case of Q's being the dependent variable are given in Table 6.

Table 6 - Short- and Long-Term Coefficients

Independent Variables	Short-Term Coefficients	Long-Term Coefficients
Q_{t-1}	0.191 (1.378)	
A_t	1.165 (23.271) *	1.403 (15.927)*
A_{t-1}	-0.288 (-1.724)	

Independent Variables	Short-Term Coefficients		Long-Term Coefficients
A_{t-2}	-0.014 (-0.298)		
A_{t-3}	0.124 (2.637) **		
A_{t-4}	0.149 (2.864) **		
K_t	0.490 (15.123) *		0.436 (12.022)*
K_{t-1}	-0.138 (-2.056) ***		
L_t	-0.015 (-2.948) **		-0.019 (-3.523) **
C	-594.541 (-2.861) **		-735.017 (-2.821) **
ECM_{t-1}	-0.811 (-5.688) *		
	Diagnostic Tests		
R^2	0.985	$\chi^2_{BG}(1)$	1.866 [0.161]
$\bar{R}^2$	0.978	$\chi^2_{RAMSEY}(1)$	0.342 [0.737]
DW	2.781	χ^2_{NORM}	1.289 [0.525]
F statistic	141.494	$\chi^2_{WHITE}(1)$	0.389 [0.926]

Note: The values in parentheses are t statistic values.$\chi^2_{BG}\chi^2_{RAMSEY}\chi^2_{NORM}and\chi^2_{WHITE}$ are respectively Breusch-Godfrey test for serial correlation, the Ramsey regression specification error test, the Jarque-Bera test for normality and the White test for heteroskedasticity. RSS is the sum of squared errors. The values in brackets represent the p-probability values for the diagnostic tests. * and ** respectively represent significance levels of 1% and 5%. The error term (ECM) series was found to be stationary at the level value (P<0.01).

Source: It was created by the author based on the results of the ARDL analysis

Looking at the diagnostic test results of the ARDL (1, 4, 1, 0) model in Table 6, we find that the p (probability) values for the tests for serial correlation, heteroskedasticity, regression specification error and normality are greater than all α significance levels (1%, 5% and 10%). Therefore, it can be said that there was no diagnostic test problem for the ARDL (1, 4, 1, 0) model established.

Considering the long-term estimation results in Table 6, we can see that the TFP and capital variables are statistically significant at level of 1% while the labor variable is statistically significant at level of 5%. As seen in Table 6, in the long term, the TFP and capital make a positive effect on the output while employment is affected negatively.[2]

The TFP has a significant and positive effect on the output. An increase in the TFP significantly increases the sector's output. It can be said that this result is compatible with economic expectations. One unit increase in the TFP increases the output by 1.403 units. The parameter, too, is statistically quite significant. This result is consistent with the literature.

Moreover, of other independent variables estimated, the capital also found to have a significant and positive effect on the output. Thus, one unit increase in the capital increases the output by 0.436 unit.

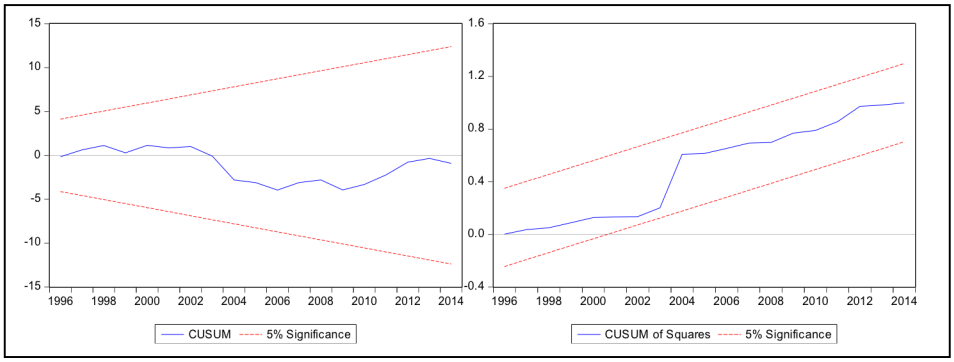
Being the other independent variable of the model, the employment was estimated to have a negative effect on the output. The economic expectation is that the employment has a positive effect on the output in the long term. The study's findings differed from this expectation perhaps due to the lack of the data that would fully correspond to the outputs and inputs and the data used to compensate for this. Indeed, the output variable used in the study is the gross value added, expressed in a monetary value, which refers to the factor incomes from a production activity in a workplace as shared by the production factors which take part in the production. Moreover, the sum of production and non-production workers was taken as employment in the study.

When the coefficients of the independent variables estimated in the long term, the variable which had the biggest effect on economic growth in the long run was found to be the TFP with a coefficient value of 1.403.

[2] In the relationship estimated between the input and output variables with the Cobb-Douglas production function under the constant returns to scale assumption, the labor input was found to have significant positive effect on the output. For this, see Table 2.

After the long-term relationship was established, the error terms obtained from this relationship and the difference values of the variables were used to estimate the short-term relationship. The short-term results estimated are given in Table 6. When the short-term coefficients were taken into consideration, it was found that the TFP values for the current terms and three and four periods ago (excluding the values one period and two periods ago) as well as the coefficients of the capital were economically and statistically significant. More precisely, the TFP's values for the current period and three and four periods ago as well as the capital values had positive effects on the output in the short term in the Turkish automotive sector and these effects were found to be significant. A significant, but negative correlation was found between the labor and the output in the short term, as was the case in the long term. On the other hand, as seen in Table, the fact that the ECMt-1 error correction coefficient is negative and statistically significant confirms the long-term relationship between the output and the TFP, capital and labor in the Turkish automotive sector. The model's error correction term was estimated to be -0.811, and, as expected, its sign is negative and it is statistically significant at the level of 1%. Therefore, it can be said that any deviation in the output in the short term may be corrected by 81.1% in the next period to attain the long-term balance. At the same time, this means that the model is significant and works.

Finally, to investigate the structural break concerning the variables, the CUSUM and CUSUMSQ charts, which use the squares of recurrent residuals to examine the structural break related to the variables, were employed. Figure 3 shows CUSUM and CUSUMSQ charts, respectively. Studying Figure 3, we can see both the CUSUM test and the CUSUMSQ test, which is more sensitive, indicate that the model's residuals remain within limits and that parameters are stable and there is no structural change in the model.



Source: They were created using the EViews program.

Figure 3 - CUSUM and CUSUMSQ Charts (1990-2014)

If CUSUM and CUSUMSQ charts fall within the critical limits at the significance level of 5%, then the parameters estimated are decided to be stable (or consistent). Therefore, given the CUSUM and CUSUMSQ charts in Figure 2, the long-term coefficients obtained through the estimation of the ARDL model are consistent.

Conclusion

The automotive sector is a very important sector for Turkey's economy. Given the supply of intermediate goods for the sector as well as the production and sales processes, the automotive sector has positive effects on many other sectors.

This study sought to estimate the short- and long-term relationship between the inputs and outputs of the firms in Turkey's automotive sector, including the supplier industries, based on their data for the period between 1982 and 2014. In this context, first, the TFP was econometrically estimated on a yearly basis, and then, the short- and long-term relationship between the inputs and outputs using an econometric model including the TFP, namely the ARDL Bound Test method.

The empirical results of the study revealed a number of important findings for the Turkish automotive sector for the period between 1982 and 2014. Under the constant returns to scale assumption, the capital and labor made significant positive effect on the output for the period in question, and the capital flexibility and labor flexibility of the output were found to be approximately 0.59 and approximately 0.41, respectively. This finding indicates that the partial effect of the capital on the sector's output is greater than the partial effect of the labor on the sector's output. In this context, policies may be developed for boosting the capital inflow to the automotive sector, which has widespread positive effect on Turkey's economic indicators. Various measures may be taken to improve total

savings in the country and additional policies may be implemented to encourage consumers to spend these savings in the automotive sector. This may improve the capital utilization in the sector.

The study also found that the TFP levels of the Turkish automotive sector, calculated using the econometric method, differed from year to year and tended to decline during economic crises. By increasing the labor productivity, the TFP ensures more effective output. For this reason, policies may be developed to make a positive effect on the sustainable structure of the TFP so that the sector should not shrink during times of crisis. In this framework, certain arrangements should be made to make sure that these markets continue to function in times of crises and more resources should be allocated to research and development.

As a result of the ARDL bound test conducted, cointegration relationship was identified between the inputs and outputs. In the long term, the variables TFP, capital and labor were found to affect the sector's output significantly. In the long term, the TFP and capital were found to make a positive effect on the output while employment was found to have a negative effect on the output.

The sector's input significantly increases in line with the increase in the TFP. Moreover, of other independent variables estimated, the capital also found to have a significant and positive effect on the output. The capital increase in the long term in the Turkish automotive sector increases the output as well.

Of the long-term inputs studied, the variable which has the biggest effect on the production is the TFP. In order to augment the output in the Turkish automotive sector and maintain it in a sustainable form, the sector's firms should allocate more resources to their research and development (R and D) investments to drive their technological development. Moreover, the government may develop incentives geared to boost the productivity growth of firms. More effective results may be obtained if these incentives are designed to sponsor the research into technology and intelligent energy infrastructure which may play a role in improving the use of renewable and clan energy resources. On the other hand, the government should develop and implement a policy for enhancing technological infrastructure that will ensure that the sector can maintain the productivity growth in a sustainable manner.

When the short-term coefficients were taken into consideration, it was found that the TFP values for the current terms and three and four periods ago (excluding the values one period and two periods ago) as well as the coefficients of the capital were economically and statistically significant. More precisely, the TFP's values for the current period and three and four periods ago as well as the capital values had positive effects on the output in the short term in the Turkish automotive sector and these effects were found to be significant. A significant, but negative correlation was found between the labor and the output in the short term, as was the case in the long term. The study also found that any deviation in the output in the short term may be corrected by 81.1% in the next period to attain the long-term balance.

In conclusion, it can be indicated that the TFP significantly makes the biggest effect on the output than the other inputs both in the long and short term in the Turkish automotive sector. In this context, the automotive sector's policy makers should develop policies to boost the TFP in order to make the sector's long-term output sustainable.

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Strategic Focus as a Tool to Ensure Economic Stability and Security of Non-Financial Corporations as Socio-Economic Systems in Modern Russian Economy

Yuri GUSEV
RF Regions Situation Centre for Socio-Economic Development
Plekhanov Russian University of Economics, Moscow, Russia
gusev.yv@rea.ru

Tatiana POLOVOVA
Department of Management Theory and Business Technology
Plekhanov Russian University of Economics, Moscow, Russia
t.a.polovova@gmail.com

Inessa KARNAUKH
Department of Labor Economics and HR Management
Plekhanov Russian University of Economics, Moscow, Russia
inessa506@yandex.ru

Abstract:

Considering potential threats to the economic security of non-financial corporations in the Russian Federation (RF) caused by inefficient strategic management, this article aims to develop a conceptual model of a strategy which would ensure the economic stability. The study is based on the statistical method that enabled to reveal a negative trend in the development of non-financial corporations in the current economic situation in Russia, this trend being a destabilizing factor of social and economic stability. The method of structural and logical simulation was used to develop a structural-logical model of long-term economic stability of non-financial companies seen as socio-economic systems. The strategic focus of the socio-economic systems is defined as a specific target-oriented category that allows assessing the shifts in the economic stability of the system. Thus, it is possible to say that the strategic focus is an indicator of quantitative and qualitative criteria of socio-economic systems performance. This idea enabled the authors to form a complex structural-logic "Model of economic stability and security of non-financial companies as socio-economic systems". The method of monitoring and evaluating economic stability and security of socio-economic systems forms the basis for this structural-logical model. Such an approach allowed the authors to indentify whether the current strategic targets of socio-economic system are achieved. The findings were analyzed to form the conceptual provisions. Thus, this concept can be used to develop economic stability monitoring and management techniques considering the strategic aspect of the socio-economic systems operation in modern conditions. Besides, the findings of the research enabled to improve the methodology of strategic management and to ensure stable development of the real sector of the national economy.

Keywords: economic stability, economic security, self-organization, conceptual-logical model, strategic focus, vector of consumer values, socio-economic system.

JEL Classification: D21, M210, O21.

1. Introduction

Non-financial corporations are the basis for the Russian Federation development since they account for over 80% of the country's production of gross value added (Federal State Statistics Service – FSSS 2016). However, in the situation of geopolitical imbalances and the financial crisis the growth rate of non-financial corporations' production demonstrates a steady decline. The functional efficiency of socio-economic systems goes down, which threatens the economic stability of companies and stagnation of real economy. One of the destructive factors of this steady trend is the inefficient strategic management in corporations. Changes in the socio-economic systems development, along with their complex functional structure result in the emergence of two vectors that can be used to improve the management mechanism, taking into account the increasing uncertainty of the environment as well as economic and management risks (Engert *et al.* 2016). The first vector deals with the desire of non-financial corporations to expand their own innovative opportunities due to their increasing importance, such as being a significant factor of modern economic development, which, nevertheless, carries a lot of risks. The second vector is determined by the visible contradictions between the internal and external factors that are prerequisites for the reform of the management mechanism and that should comply with the new model of the Russian economy. In the context of the current financial crisis of the national economy, the abovementioned problems cannot be solved by some applied approaches. In this regard, it seems viable to focus on theoretical and methodological issues of system-wide study of economic stability in the framework of economic security and socio-economic systems. At the same time, ensuring economic security, socio-economic systems should use their potential of

permanent transformation and overcome internal restrictions. These transformations should result in the formation of dissipative structures with a higher level of organization and effectiveness in achieving the strategic goal (Plott *et al.* 2013). In this case, it is possible to talk about the self-organization of a system in the course of its evolution, which is a key factor in ensuring the strategic stability of a system.

Thus, it is necessary to develop new conceptual theoretical and methodological provisions for ensuring economic stability of socio-economic systems that are integrated in the structure of control theory and are based on the complex of methodological foundations, essential characteristics of non-equilibrium systems and conceptual models of their economic sustainability. This approach will significantly improve the economic stability management to ensure the companies long-term operation in the conditions of unstable Russian economy.

2. Literature review

The main important semantic elements of socio-economic systems self-organization were formed by the ideas of seeing the world as a unified self-developing complex (Babkova 2014), open systems and feedbacks (Russell and Cohn 2013), management of complex systems and entropy process (Wiener's cybernetics), non-linearity and openness of a system (Haken 2014).

Among papers considering the self-organization of socioeconomic systems, we would like to highlight the works by Milovanov (2015). In his research V.P. Milovanov presents the findings on self-organization of open and non-equilibrium socio-economic systems, the emergence of structures in these systems. The researcher demonstrates that regular socio-economic systems appear as order from the chaos of strange attractors as a result of the bifurcation of virtual stable limit cycles.

In addition to this, we should mention the research on sustainability of socio-economic systems. The first mathematical model of general economic equilibrium was proposed in the late nineteenth century. L. Walras and A. Marshall considered instability in the context of the set of equilibrium points: unstable position always lies between two stable ones (Plott *et al.* 2013). Since the 1930s, the problem of equilibrium stability has been explored by P. Samuelson, K. Arrow, F. Hahn (Vane and Mulhearn 2010).

Studying the problems of sustainability of socio-economic systems, scholars more and more often turn to the catastrophe theory, non-equilibrium dynamics and synergy. They base their works on studies of nonlinear processes in natural sciences and the idea of certain universal algorithm of self-organization and complex systems development (Erokhina 2011, Knyazeva 2014, Prigozhin and Stengers 2016). However, direct comparison of the development levels of natural and social sciences do not seem appropriate. Research on the stability is closely linked to the study of chaos issues. The phenomena of "chaos" and "uncertainty" apparently turn into new "framework factors" which at the beginning of the twenty-first century become extremely important, if not decisive, for the global economic and political trends (Khodorowsky 2014, Baumgartner and Rauter 2016, Engert *et al.* 2016).

Scientists are attempting to investigate the stability under conditions of uncertainty and chaos, as well as the economy transition from one economic structure to another through a stage of chaos (Smith 2015, Wiener 2013). Here, the stability is defined as the property of systems which demonstrate signs of non-equilibrium and tend to overcome the impact of changes in the external environment through their own development (He, Yu and Gu 2016). When developing, the system is not only determined by economic, political and socio-cultural external factors, but also determines these factors itself. This is how the unstable socio-economic system moves to a new qualitative state, which later turns into a stable one, adequate to the new conditions (Wiener 2013, Legg *et al.* 2015, Drury 2015). If the system can transform into a qualitatively new system or create a different model for the subsystems and their structure elements, along with the ability to maintain the new order, it can be assumed that the system is capable of sustainable development (Haken 2014). Therefore, to ensure stability in the long term, the economic system must be capable of self-organization, *i.e*. the ability to deliberately move into a new state.

In this regard, the authors of this paper propose the following detailed definition of the concept, where the stability of a socio-economic system is understood as a property of a dynamic system to give timely and adequate response to fluctuations under the impact of external and internal factors and to remain or return to a dynamic functional-adaptive weakly non-equilibrium area of a structurally stable system or a dissipative transition of a non-equilibrium nonlinear system to a new qualitative state due to objective procedures of the correction of controlling actions, which enables to transform the whole self-organizing system with focus on achieving objectives through operation or development.

The economic component plays a very important role in ensuring the stability of the socio-economic system. In this regard, it is necessary to analyze and find theoretical and methodological foundations for studying the issues

of strategic management. The scientists mainly focused on proposing strategies of socio-economic systems development (Ansoff 2009, Spender 2015, Vane and Mulhearn 2016.)

However, there has been no sufficient research on the development of methodological and methodical approaches which would allow describing and analyzing the development of the model to control the stability of a socio-economic system from the strategic perspective. Thus, it is necessary to develop the most complete set of functional tasks for the strategic plan that would ensure the stability of the socio-economic system, taking into account the combination of relevant guidelines and business concepts emphasizing the relevant priorities. Thus, the study aims to develop the structural-logical model to ensure the economic stability of socio-economic systems through establishing the strategic focus of the system using Russian non-financial corporations as an example.

3. Analytical review

According to the statistical analysis, Russia's real economy represented by non-financial corporations demonstrates a negative trend in its development. For example, since 2012 a slowdown of gross value added in the real sector of the Russian economy as of 2015 amounted to 52%, and 10% compared to 2002 (Figure 1) (FSSS 2016).

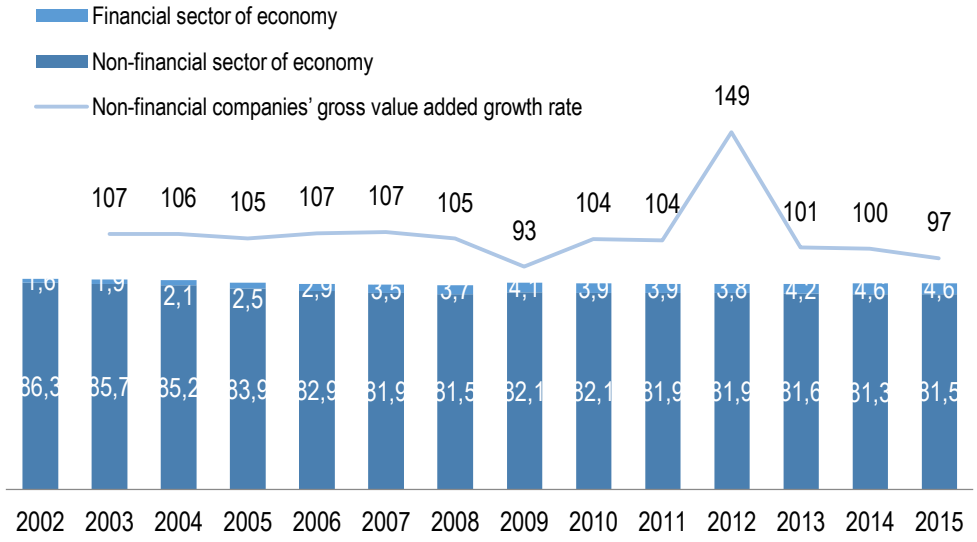

Figure 1 - Russian GDP structure in financial and non-financial sectors, as % of gross value added

As the analysis demonstrates, there is a negative trend of economic stability of non-financial corporations. Along with a steady reduction in production profitability over the last 5 years by 4.4% and return on assets by 5%, the share of loss-making non-financial institutions has increased by 13.1% with a corresponding reduction of profitable corporations (Figure 2) (FSSS 2016).

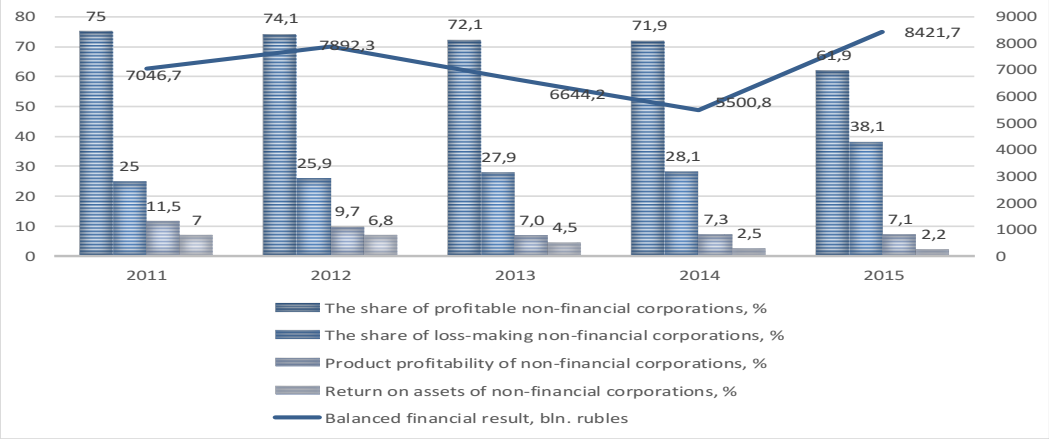

Figure 2 - Indicators of economic stability of Russia's non-financial corporations

Reduced economic stability of non-financial corporations in the Russian Federation results from a significant reduction in their economic efficiency. The decline in the monetary income growth by 6.6% triggers the decline in

industrial production by 5.6% (Figure 3) (FSSS 2016). The development of the current trend will cause the growth of unemployment in the Russian economy and raise a threat of its stagnation, which would have an immediate negative impact on the security of the socio-economic system of the country.

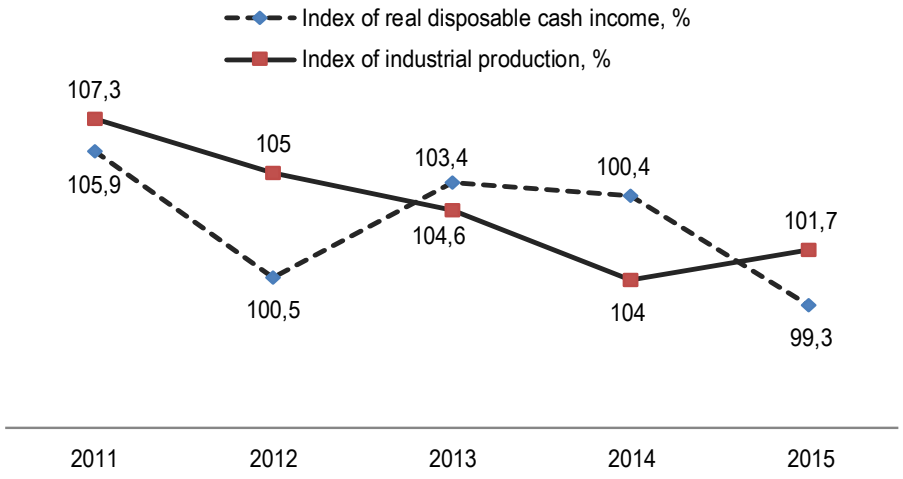

Figure 3 - Indicators of economic efficiency of Russia's non-financial corporations

One of the key reasons for decline of non-financial corporations is the poor quality of the modern management system that does not ensure their economic stability. Structural and functional disorder is also seen as the most common cause of the ineffectiveness of non-financial corporations, which manifests itself in breaking the links between the structure-forming elements: goals, objectives, economic conditions, technical and technological basis, functional and behavioral approaches, etc. The management is incapable of taking effective decisions in the situation of destabilizing external and internal factors. If the management system is not developing adequately to the production increase and does not overcome problems arising due to improvement of qualitative characteristics of the company, it will become bankrupt – this is the law of the market economy (Russell and Cohn 2013, Prigozhin and Stengers 2016). This situation necessitates the search for managerial approaches to ensure sustainable economic security of non-financial corporations as socio-economic systems. The mechanism of strategic management should be formed, according to the strategic focus of business management of non-financial corporations as self-organizing systems.

In its operation, the self-organizing system adapts to new conditions and seeks stability that is the basis of the internal mechanism of economic security, as well as self-organization and self-development of socio-economic systems. The stability of the system is determined by the system ability either to adapt and develop (with changing the basic characteristics, the composition and structure of the system components when natural transformation takes place), or to restore the previous operating parameters, which means the system remains the same (Loktionova 2013).

Improvement of the management of non-financial corporations as self-organized systems will facilitate independent decision-making when the situation is changing rapidly and one has to act independently to a certain extent. This will enable to use systematic approach to solve the problem of ensuring the stability of s socio-economic system, and this will enable a non-financial corporation to restore its original, or close to the original, management system with a minor distortion and to resume normal operation after a sharp disturbance of the workflow, while maintaining the qualitative characteristics of the previous state.

4. Results

Self-organization is possible if the system is dynamic, open, and has a large number of interacting elements, with their behavior coordinated, thereby improving the degree of order, i.e. entropic processes are suspended, while the system becomes more complex and regular, than the stage before the transition. This allows us to conclude that if the system itself is able to regulate its internal structure and acquire temporal, spatial or functional structure, then it is self-organized. This finding is the basis for understanding the phenomenon of self-organization (Khudyakov 2015).

Methodological tools of the research are based on dialectical methods of knowledge that allow their comprehensive and objective study. The system of economic stability and security of socio-economic systems considering its strategic aspect is formed by the methods of systemic analysis, observation and graphic

representation of data, methods and techniques of data formalization and systematization. The main provisions of the study are based on the theory of systems, as well as the original integrated approach, proposed by the authors, to the study of socio-economic systems functioning and development, for example, the methodological approach to the information-analytical assessment, status monitoring and management of the economic stability of a self-organizing system.

A set of interrelated basic methodological provisions underlying the logic of formulating a plan of economic security in the form of reasonable scenarios, reflecting its situational nature, a combination of factors affecting the stability of business entities allowed the authors to develop and propose a structural-functional model of formation and management of the strategy that ensures economic stability of non-financial corporations as socio-economic systems (Figure 4, 5, 6, 7). The basis of the model is the sequence of steps and includes an additional component of the strategy – the strategic focus.

Developing an adaptive model, we resorted to structural and functional modeling according to IDEF0 methodology. It is used to create a model that reflects the structure and the system functions, as well as data and material flows in the system. Structural and functional modeling is represented by means of a graphical description of the sequence of actions.

IDEF0 methodology is based on the following concepts:

- A model is a simplified artificial object that represents the basic functions, properties and components of the system under study. The model is constructed to describe the processes occurring in the system, relations between them and the tools used to perform system functions.
- Block modeling and graphical description of the processes. According to IDEF0 methodology, a modeled system is represented as a block – a set of sequential processes, occurring in the system under study, and the relations between them. The system interaction with the environment is described by inputs that appear on the left of the block, outputs – on the right side, control –on the top, and mechanism – below.
- Entering arrows represent the resources used by the system to perform its functions, while the output is the result of the system operation. Control denotes policies and procedures that define the operation of the system, the mechanism – the resources needed to perform the functions of the system. In the course of management and using specific mechanisms, the system transforms inputs into outputs.
- Conciseness and accuracy. Graphic simulation enables clear and concise visualization of the system elements and connections between them, and helps to identify problems in the existing structure.
- Rigor and formalism. Building a model in IDEF0 methodology requires strict adherence to formal rules that ensure the coherence, clarity and precision of the model.
- Iterative modeling. Creation of a model in IDEF0 methodology is an iterative process with a step-by-step improvement.
- Differentiating between an organizational structure and the system functions. One should prevent "linking" the features of the system under study to existing organizational structure of the modeled object, which enables to generate recommendations to improve existing business processes of the system (Emelyanov 2014).

Computer simulation software BPwin is a tool used for IDEF0 structural and functional modeling. A structural and functional model consists of four composite blocks:

1) "Model of ensuring economic stability and security of non-financial corporations as socio-economic systems";
2) "Model of decomposition of monitoring changes in the level of economic stability of socio-economic systems";
3) "Decomposition of a strategy of socio-economic systems sustainable development";
4) "Decomposition of business model development for socio-economic systems".

The *"Model of ensuring economic stability and security of non-financial corporations as socio-economic systems"* represents the sequence of the main stages of implementing strategies for economic sustainability of non-financial organizations. Each stage implies using appropriate methods of research, which, used as a source of information, enables the implementation of this stage.

"Model of decomposition of monitoring changes in the level of economic stability of socio-economic systems" depicts the sequence of the stages of monitoring changes in the level of economic stability of socio-economic systems (SES) to perform the controlling function of strategic management.

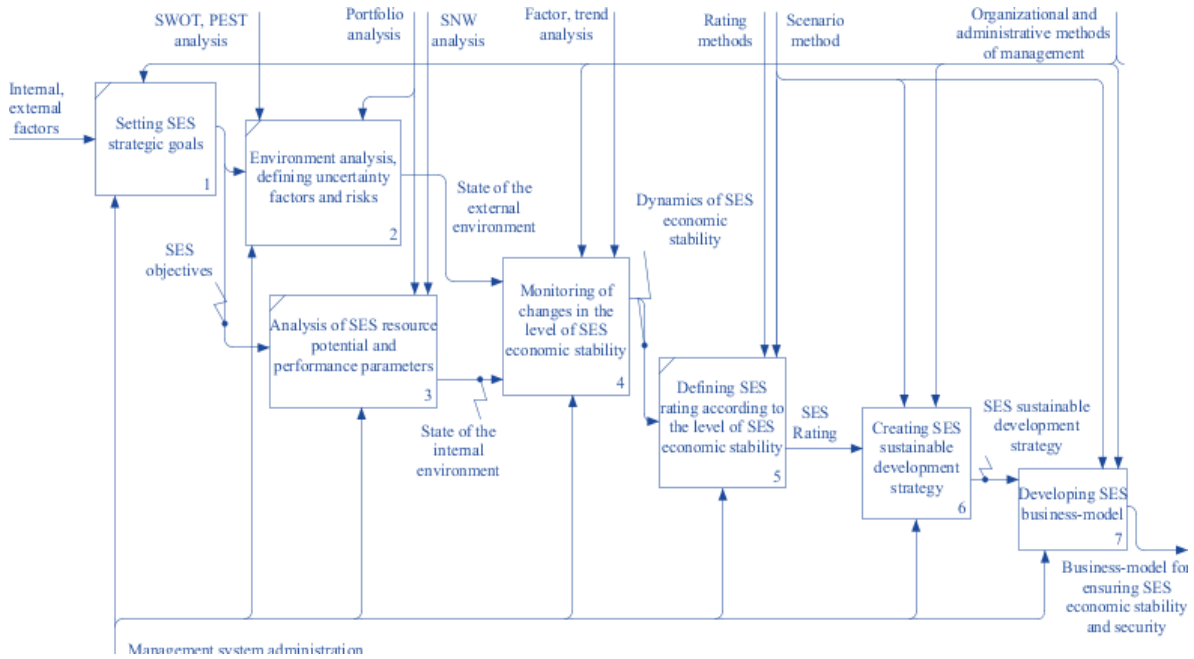

Figure 4 - Model of ensuring economic stability and security of non-financial corporations as socio-economic systems

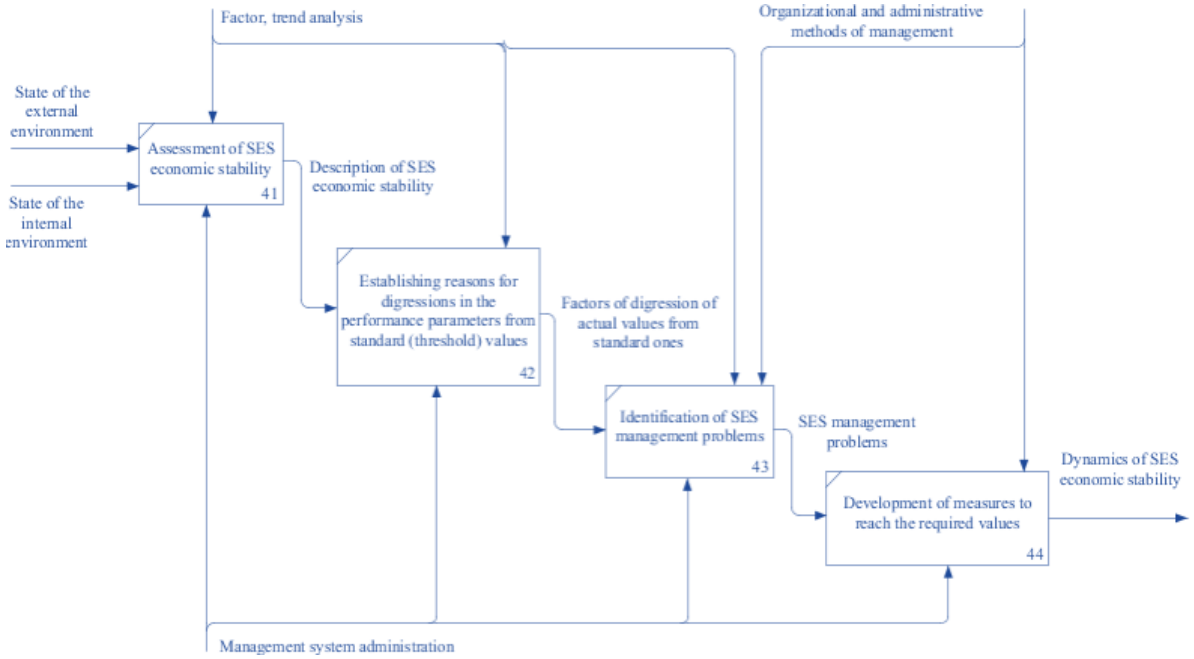

Figure 5 - Model of decomposition of monitoring changes in the level of economic stability of socio-economic systems

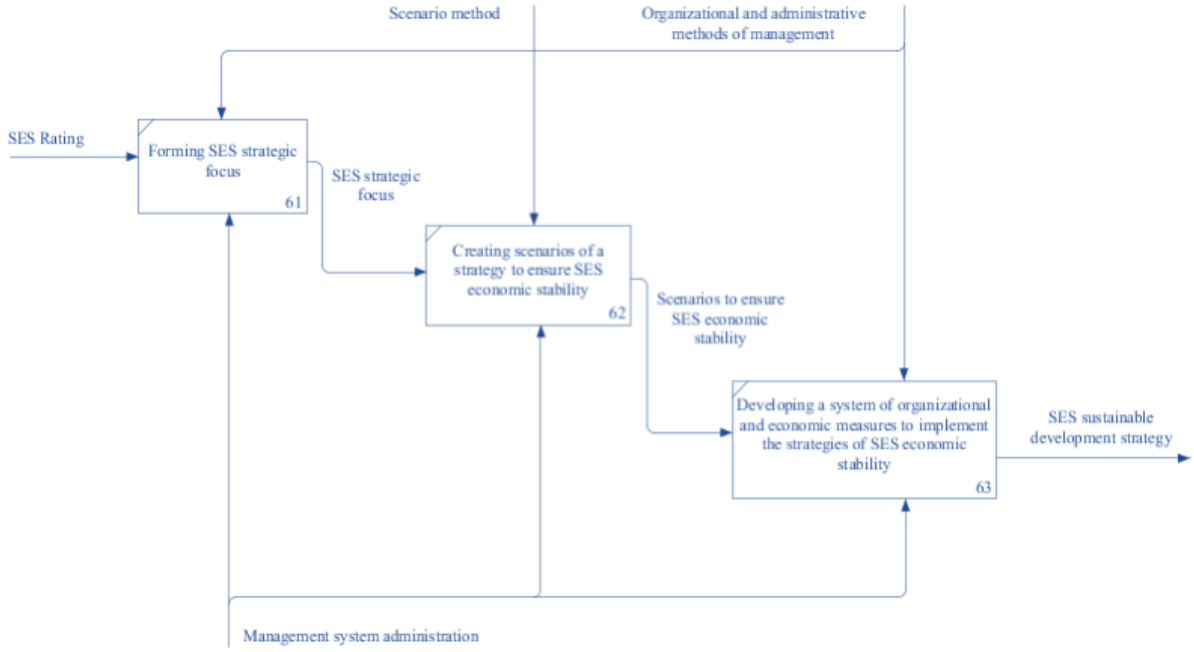

Figure 6 - Decomposition of a strategy of socio-economic systems sustainable development

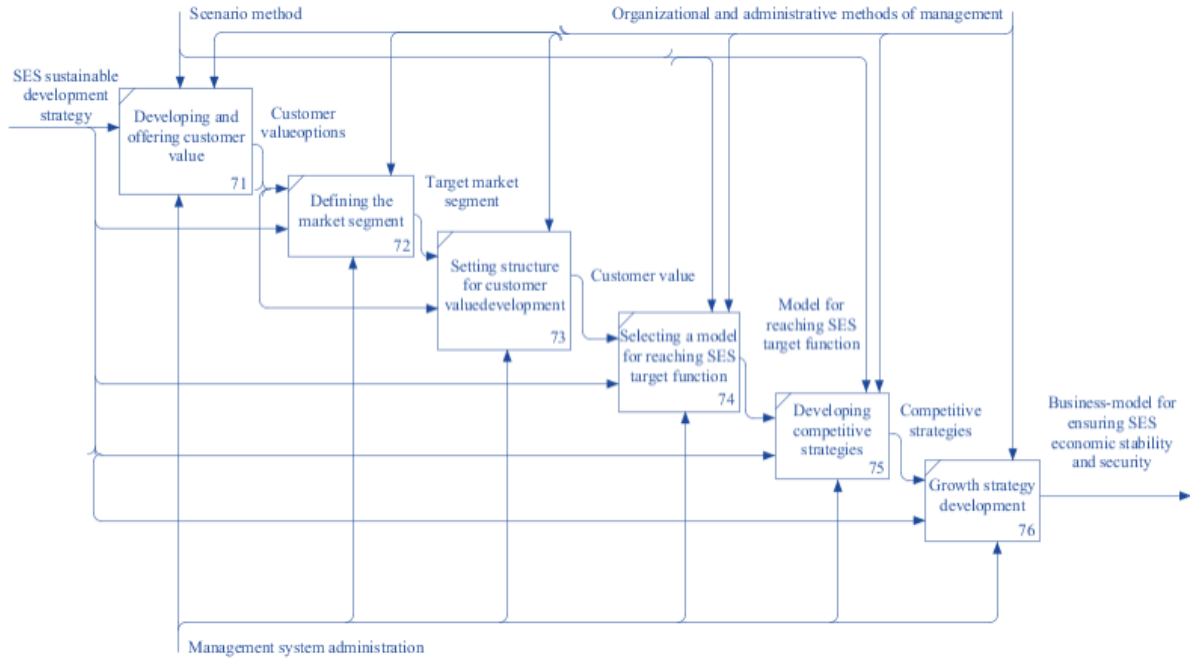

Figure 7 - Decomposition of business model development for socio-economic systems

"Decomposition of a strategy of socio-economic systems sustainable development" represents the sequence of the tasks of a strategy developing aiming to ensure the economic stability of non-financial corporations on the basis of the previous stages of "The Model of ensuring economic stability and security of non-financial corporations as socio-economic systems".

"Decomposition of business model development for socio-economic systems" includes the constituent elements of a business model formation, carried out in accord with the strategy which ensures economic stability of a socio-economic system.

5. Discussion

The proposed structural-logical model to ensure the economic stability of non-financial corporations as socio-economic systems enables, in contrast to existing approaches, to give a reasonable solution to some of the fundamental problems of developing a strategy of economic stability for socio-economic systems. The strategic focus, constituting the basis of business decision-making, becomes a verification tool to ensure the achievement of the strategic goals of the system, while reaching them is monitored and can be checked by assessing the economic stability.

The proposed model is based on the following conclusions.

Conclusion 1. The original authors' concept of a socio-economic system as a self-organizing system determines the choice of effective functioning and development paths by ensuring the estimated level of economic stability.

Conclusion 2. In contrast to existing approaches, the proposed procedure of socio-economic systems sustainability development considers the strategic aspect and implies some new stages: the formation of the strategic focus of the socio-economic system and monitoring of its economic stability. Monitoring of economic stability is a tool to significantly improve the validity and reliability of methodological provisions that deal with obtaining the results of the economic stability assessment and monitoring the dynamics of the system parameters that form the basis for developing scenarios of economic stability maintenance. In turn, a well-chosen strategic focus helps business entities to avoid many typical mistakes. This can be achieved by using a sequential procedure of strategic focus formation:

- identifying the strategic focus content;
- forming the optimal "portfolio" of businesses according to available options (organic development, mergers and acquisitions, alliances, sales of inefficient or non-core assets);
- setting investment priorities;
- developing competencies and resources at the corporate level;
- determining the organizational structure and developing the key processes, including the distribution of authority, responsibilities and resources between business units;
- setting financial and strategic goals of the socio-economic systems strategy.

Conclusion 3. The strategic focus becomes the basis for identifying points of growth, as well as creation of development scenarios. In this regard, the strategic focus may be based on the following aspects which comply with:

- *firstly*, development trends and the response to new opportunities and threats in the external environment to ensure productive performance;
- *secondly*, the possibilities of the resource potential, preventing the crisis processes that take place due to certain behavioral aspects of the system operation in the uncertain external environment, as well as environmental factors that create new opportunities;
- *thirdly*, goal-orientation of socio-economic systems performance with their focus on a product/service, customer, market and production type, marketing and distribution method, as well as innovations based on technologies showing the potential of a global revolution.

The first aspect is particularly important as it sort of helps identify growth points, most of which are located in the external environment. For example, analysts of Citi Research, working in conjunction with the University of Oxford, identified six global megatrends for the coming decades which will seriously alter the economy and the world order. *Business Insider* gives a brief description of them (Haken 2014), as following:

- Trend 1. Borders opening and integration processes in the economy create prerequisites for the reduction of customs tariffs and freer movement of goods and services.
- Trend 2. The aging of the world population makes the governments responsible for taking full care of the non-working part of the population for the coming 20 years or more.
- Trend 3. High economic efficiency of "the technologies of the future" (nanotechnology, breakthroughs in genetics, 3D-printing, etc) will significantly increase the global market turnover.
- Trend 4. The world economy driver will be determined by its growing dependence on developing countries (China and India), which have demonstrated a steady increase in income and living standards, which leads to the emergence of the largest consumer on the global market.
- Trend 5. There are growing systemic risks for the companies in international business due to possible catastrophes and disasters that could disrupt supply chains and production itself.

- Trend 6. The system of global management requires a task-oriented reorganization of the international risks confrontation mechanism.

That is, when determining the type of business and guided by certain strategic intentions, the socio-economic system can choose between six options of the global megatrends considered above. However, it can make its decisions, selecting another option that also influences the economy. For example, one can predict the best development prospects for a company working in some traditional fields: tourism, hotel and catering business, transport and logistics, retail and personal services, education, medicine and social services.

The second aspect, related to the scope of resource potential, stems from the need to ensure the economic stability of an economic entity in the long term. At the same time, to develop sustainably, the company, using the available resource potential, should develop a competitive advantage of its products and services, maintaining competitive position sufficient to confront the threats and risks.

The leading position on the market can be achieved by transformation of new ideas and trends into an offer of a new customer value in the form of products or services. The point is that the values represent objects of the real world that have a certain significance to a person, and this value is determined not so much by the properties of the objects but their role in a person's activities, interests and needs (Milovanov 2015). This highlights the link to the third aspect that is crucially important in the development of a business vision regarding the strategic focus. The latter is based on possibilities that enable accurate concentration on priority areas. We mean the business opportunities that facilitate its development and correctly identify the relevant directions which include the following:

- products/services (identifying the highest number of customer categories which potentially want to purchase a particular product, as well as future products closely connected with the original product);
- clients (with focus on developing the highest number of products which can interest this group of clients);
- market type (covering a client group which is clearly specified, but has a wide range of categories);
- production type (focus on one or two modes of production to take a leading position in this market segment and get the main share of the market);
- marketing method (selling through catalogs, by phone, direct mail advertising);
- distribution (sales of products through marketing networks).

Thus, we are talking about how to develop sustainably, and for this it is necessary not only to follow the main global trends. One should also use their advantages and create on the basis of the resource potential of the socio-economic system the competitive advantage of products and services through transformation of new ideas and trends when offering new values to consumers.

Conclusion 4. The concept of values combines the discussed aspects of the strategic focus as a tool that provides strategic competitive advantage in the market place and, consequently, economic stability through a number of specific features. Both theory and practice show that values do not appear in their final state, they can only be formed in the system of socio-economic relations of market players. At the same time, considering the values from methodological perspective allowed us to identify at least four aspects in the understanding of this phenomenon. In our opinion, values can be classified according to the following criteria:

- values defined by the marketing appeal of services in the system "socio-economic system – consumers". From consumers' point of view, the socio-economic system exists only to create value for them, helping them to fulfill their intentions. As a result, the power is transferred from a business entity to consumers of services. At the same time, the socio-economic system often creates a product of which a potential consumer has not yet formed an idea. In this respect, the manufacturer of the product has more influence;
- values stemming from the significance of scientific knowledge (including technology). The society has been changing rapidly over the recent decades. This mainly refers to building up the scientific and technological potential of the society and changing its communications infrastructure, which promotes a change in the socio-cultural social order;
- values that are typical for the society as a whole. The transformation of the social system leads to the society transition from the industrial to the information one. Many researchers have aired their opinion on this ongoing changes in the social structure understood as a transition from the industrial society to a new type – the information society. Indeed, according to many estimates, up to 15% of people starting their business get 40% of total revenue, and up to 60% of profit (Aghanbegyan 2015, Baumgartner and Rauter 2016). Values also change since there are always certain social groups with their preferences, or criticism of the system of social values behind social ideals;

- focus on the social system is a prerequisite for human development. Values change due to constant changing of the environment and requirements for the manufacturers of products and services because of innovative processes occurring in the society (Smith 2015). However, rapid and chaotic changes do not enable the stability and sustainability of socio-economic systems.

From marketing perspective (the first aspect in the understanding of the value), the offer of customer value includes, first, a description of the problem that a customer has, and secondly, ways to solve this problem by means of its customer value. Here one should remember that the correct assessment of customer value, created by the socio-economic system, is necessary not only to interest consumers, but also for efficient price-setting. That is why the service value to the customer should be the leading factor when determining its price. The accurate assessment of this value can be done only practically, experimenting with real customer groups, for example, by forming different packages of services. If the price charged for a product or service is less than the benefits received by a client through them, the offer will have good value for the buyer.

The second aspect in understanding the nature of value is closely linked to innovations and the behavior of the company-innovator, whose strategy is to win in the long term. At the same time, companies-innovators can yet be no leaders in the competition or to be fast-growing, eager to develop consumer values through innovation. As the works by domestic and foreign authors show, the greatest success is achieved by those companies-innovators that work in all three areas of new customer value creation (*product, service and delivery*), each of them providing new possibilities along with changes in consumers type and technology.

Companies-innovators are looking for and implement revolutionary ideas, offering consumers new products and services, i.e. new customer value, in some cases, changing the entire industry. Creating a new customer value poses a number of questions. For example:

- what should be left behind, including the situations involving violation of rules of the game at that market?
- how should one change the priorities regarding the attention paid to this or that product or segment?
- which new products should be created or what priorities should one set?

Thus, innovators focus on identifying preferences of the majority of customers. Innovators try to offer the consumer a holistic solution, eliminating the inconvenience which the consumer had to put up with before, going beyond usual tasks of the industry. This approach is typical of a small number of companies.

However, creating a new curve of customer value, the social and economic system, over some time being dependant on the industry sector, may be subjected to pressure from competitors that copy the product innovation, thereby forcing an innovator into the competition. This threatens the growth and profits of socio-economic systems. In these conditions, the company-innovator has two options. The first option implies following a strategy similar to those of the competitors, which will lead to averaging the curve of consumer value. The second option involves the search for innovation to leave companies-innovators behind which means a shift in consumer priorities. This is illustrated by the case of the Belgian cinema network Bert Claeys, creating the Kinepolis – the first megaplex in the world with 25 halls and 7600 seats. Megaplex business model offers the lowest cost structure in the industry. The new customer value allowed saying not “Let’s go to the movies”, but “Let’s go to the Kinepolis”. Bert Claeys ceased fighting for a specific customer segment and became inaccessible to competitors (Zykov and Leontieva 2014).

However, as an exception, there are other possible options. For instance, if the company sees that its value curve is very different from the curve of the entire industry, and this difference is highly appreciated by customers, while the strategy remains very profitable, the company may go on without innovation. In this case, the company should focus on increasing its market share and economizing through increasing the scale, for example, by means of geographic expansion, deriving its potential benefits. By acting in this manner, the company can deal with those trying to copy the innovation and derive all potential benefits. For example, developing the concept of the Kinepolis, Bert Claeys built Metropolis in Antwerp, as well as a number of multiplexes in Europe and Asia (Savichev 2015).

Thus, from strategic perspective, the winners are those economic entities that either know market rules better than others or create them. At the same time, in many ways the second aspect of the value concept (regarding the importance of scientific knowledge) is closely linked to the third aspect (common social values), with the apparent dominance of the latter. Changes in social structure require new knowledge, technologies and innovations.

The fourth aspect of the value essence results from the fact that the behavior of the company is influenced by the understanding of the rules of the game on the market, or creating them for one’s business, which can cause sudden changes in the market. In this case, companies have to act creatively and fast when developing a strategy.

Ambition-Driven Strategy (proposed by Arthur D'Little – an international consulting firm) may be considered an example of a new generation of methodological approaches to strategy development.

This approach to strategy development has three fundamental differences from the traditional one:

- the content of the strategy is based on ambitious targets;
- the strategy is sensitive to the behavioral aspects of the company staff, and their management is to ensure achieving the objectives set;
- continuous management of transformation, based on a balanced system of criteria.

As one can see, finance-oriented management that was dominant until recently is replaced by the new "innovation management" which implies constant restructuring of a company to implement the chosen strategy. Most advanced companies began to consider financial success as a side effect of the successfully implemented strategy. Profit criterion is now important but not the leading one. The share of non-financial and non-quantitative assessments of business has increased, and they became the crucial aspect of a strategy.

In cases like that, the most successful strategy is the one involving the creation of advantages that cannot be copied. Another aspect of this strategy is working "ahead of the curve", which itself forms the environment (the market) and the desired situation there. In other words, all four fundamental values reflect real business aspects of socio-economic systems, and they should be considered as complementary to the overall concept of business values, aiming to support self-development of economic entities in the long run.

Conclusion 5. The current dominance of innovation-driven economy preconditions the focus on innovations involving technologies that have a potential of a global revolution. For example, McKinsey Global Institute have analyzed 100 technologies possessing the potential of a global revolution until 2025 and its impact on hundreds of millions of working people and billions of consumers and identified 12 areas: mobile Internet: smartphones, tablets and other mobile devices will help to attract additional three billion people into the "networked world"; automation of intellectual labor which used to be beyond computers abilities; "Internet staff" (built-in sensors and actuators, infrastructure); cloud technology, enabling all sorts of internet services and new business models; advanced robotics (including "exoskeletons"); new-generation genomics (new ways of treating diseases, innovations in agriculture and biofuels); self-driving and partially self-driving cars; accumulation and storage of energy (battery technology development); 3D-press ("printing" objects); advanced materials (nanodrugs, supercapacitors for batteries, ultra-smooth surfaces and ultrathin screens); modern methods of oil and gas exploration and extraction; renewable energy (wind and solar energy as the most promising ones).

In 2025, the economic effect of their use may reach a figure varying from 14 to 33 trillion US dollars (Drury 2015). In this case, the strategic focus of innovators implies a proposal of an entirely new product or service and allows them to gain an advantage in the market, without wasting their resources on the same products the competitors have. In a situation like that innovators will find and embody revolutionary ideas, offering consumers new products and services, i.e. new customer value, in some cases, changing the entire industry. However, this approach is adopted by a small number of the companies, capable of expanding their business in the areas that involve the use of technologies with the potential of a global revolution.

Conclusion 6. Advantage on the market can be gained by transforming new ideas and trends to offer consumers a new customer value in the form of products or services, and that is why the vector of the value can be constructed in the coordinate system "new technology – trends in the economic changes – the social and the economic system potential" (Figure 8).

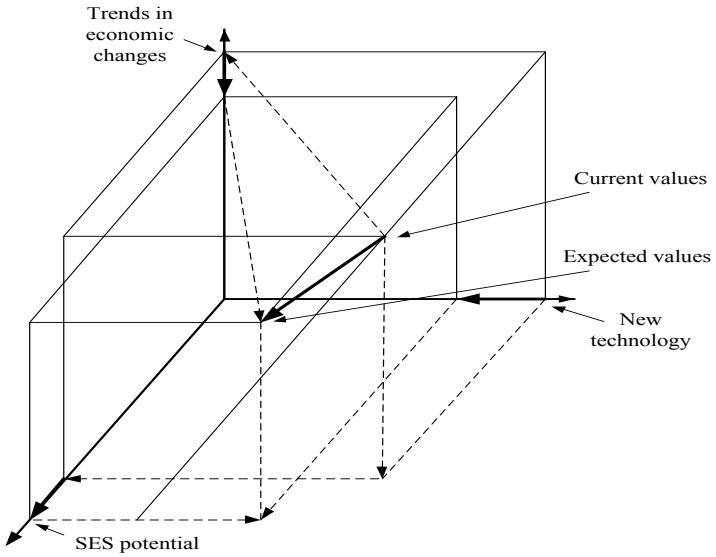

Figure 8 - The conceptual framework depicting the formation of a new vector of customer value for non-financial corporations as socio-economic systems

Ideally, a partnership with customers facilitates the socioeconomic system ability to anticipate customers' needs even before customers are aware of them.

Conclusion 7. The proposed approach to the formation of the values vector creates methodological framework for developing a realistic strategy, *i.e.* building business according to one's own vision. Using this strategy as the basis, the socio-economic system can maintain economic security and create sustainable market advantage that complies with its business priorities.

Conclusion

As part of the empirical study, the statistical analysis of the current state of Russian non-financial corporations allowed the authors to conclude on the ineffectiveness of strategic management as the main destabilizing factor in the companies' economic stability and the need to manage them as socio-economic systems. Review of scientific works enabled to refine the definition of the concept of economic stability of a socio-economic system. This definition reflects the links between economic stability assessment, monitoring and management, considering strategic risks and using a methodological approach to the information-analytical assessment system, status monitoring, and management of economic stability of socio-economic systems. This approach allowed the authors to form a structural-logical model of the strategy for economic stability of non-financial corporations as socio-economic systems. A distinctive feature of the model is the presentation of the strategy implementation process as a consistent set of management stages, based on the logical structure of economic stability that defines its essence, requirements to the system properties, characteristics of its condition, the degree of equilibrium and transition to a new qualitative state. Working on the conceptual model of economic stability strategies development, the authors could identify a new stage of the economic security strategy – "defining the strategic focus of the socio-economic system". This stage allows setting long-term goals and functional objectives for non-financial corporations, which in turn ensures the strategy effectiveness and long-term stability of the socio-economic system in the national economy under high risk and chaos. Conceptual provisions, presented in the article, can facilitate further improvement of the methods of socio-economic systems strategic management and increase the level of economic stability of non-financial corporations in Russia under current conditions.

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Comparison of Changes in the Shares of Public and Private Funds in Cluster Budgets after 2010

Peter BURGER
Faculty of Economics
Technical University of Košice, Slovakia
Peter.Burger@tuke.sk

Abstract:

The scientific paper presented compares the share of public and private funds in cluster budgets. It is based on two authentic and independent primary surveys which were carried out in 2011 and 2016. In both surveys the addressed clusters responded to several questions concerning their budget structures. The goal of the surveys was to track changes in funding clusters during this five-year period and examine the statistical significance of such changes. The share of public and private funds in cluster budgets has not significantly changed from the statistical point of view, nor has the structure of public funds; the structure of private funds has changed relatively considerably, when the decreasing share of membership fees in cluster budgets has been compensated for by the revenues generated by clusters themselves from their own activities, and the share of venture capital, resources of "business angels" and other donors hasalso increased.

Keywords: clusters, financing clusters, cluster budgets, public funds, private funds.

JEL Classification: O31, O38, R58.

1. Introduction

The topic of clusters, cluster initiatives and cluster policies has been the subject of great concern to professional public since 1990 due to the publication of Michael Porter's book (1990) *»Competitive Advantage of the Nations«*. Other research studies have been gradually growing in number, dealing to a greater or lesser extent with cluster funding and exploring the issue from various aspects. Financing clusters is possible by employing resources either from the private sector or public sector, or by a combination from two.

A number of the above-mentioned studies examined clusters, cluster initiatives, their support and finance on the worldwide basis (Sölvell*et al.* 2003, OECD 2007, Lindqvist *et al.* 2013) or concentrated on surveying finance predominantly in European countries (Oxford Research AS 2008, Barsoumian *et al.* 2011, Lämmer-Gamp *et al.* 2011, Müller *et al.* 2012, Urbančíková and Burger 2014, Meier zu Köcker and Müller 2015). Other studies analysedclusters and their support in groups of countries which are somewhat specific and demonstrate some common features which frequently distinguish them from others (Ketels and Sölvell 2006 dealing with clusters in the EU-10 new member countries, or Ketels *et al.* 2006 exploring clusters in developing and transition economies). Similarly, part of the research studies concerned mainly financing clusters in some selected European countries (Hantsch *et al.* 2013 – clusters in Germany, France and Norway; and Sölvell and Williams, 2013 – clusters in Sweden).

These and numerous other studies have dealt with the issues of the best suitable methods of cluster funding, the shares of public and private funds in cluster budgets, the amounts of financial support from public funds, thelevels from which clusters should be supported (whether a local, regional, national or international level), the methods of creating an optimum cluster programme, and the appropriate length of government cluster support.

2. Theoretical background of financing clusters and cluster initiatives from public and private funds

The first extensive worldwide survey regarding the funding of clusters and cluster initiatives was carried out by Sölvell *et al.* (2003). They addressed a total of 509 clusters all over the world and received answers from 238 (46.76% questionnaire response rate). After an analysis of 238 completed questionnaires, which dealt with cluster funding, it was concluded that the public sector was the primary source of funding in 54% of the cases. In 25% of the clusters examined, the funds were combined from both public and private sectors, whereas in 18% of the clusters their activities were financed predominantly from the private sector. Only a small number, 1%, of the clusters were financed by universities. International organisations acted as the major funds providers in 2% of the clusters examined.

Ten years later, in 2013, the same authors carried out a similar yet more precise worldwide survey that examined 356 clusters and cluster initiatives. 356 completed responses out of 2,580 invitations gave a total response rate of 13.80%. The structure of cluster revenues was as follows: 34% of funds were provided to the cluster initiatives from private resources, such as membership fees and sales of services. 54% of financial

resources came from governmental bodies, *i.e.* from national, regional, local and international organisations. It can be said that despite the slightly different categorisation of financial resources, which was narrower and more specific in 2013 than in 2003, there still have not been big changes in cluster funding over the last ten years. It continues to hold true that the public sector and public funds are extremely important for clusters and cluster initiatives.

Public funding is often considered to be desirable in the first phase of cluster development. Lindqvist *et al.* (2013) expected that with the growing age of a cluster or cluster initiative, the proportion of private funding would increase and become more dominant; nevertheless, the survey results did not confirm this expectation. The figure below shows a decrease in the share of membership fees in ageing clusters that is partially compensated for by a gradual increase in their sales of services. On the side of cluster revenues from the public sector, there is a drop in public funds provided from the national level over the years, unlike international funding, which tends to grow as clusters mature.

Cluster funding through the Structural Funds and community programmes of the European Union has become an important part of public support to clusters over the last two decades. Whereas in many western and northern European countries it appropriately supplements other public funds (*e.g.* central government subsidies, regional government subsidies, local government subsidies), in the majority of European countries which joined the EU after 2000 this has become the major and dominant tool in supporting clusters from public resources (Ketels *et al.* 2006, OECD 2007, Hantsch *et al.* 2013, Lindqvist *et al.* 2013). In the Czech Republic, taking the initiative to set up cluster initiatives and clusters became one of the activities financed from the Structural Funds in the 2007-2013 programming period and continued later in the following programming period. Also in the case of Poland, the available Structural Fundswere one of the few key factors of cluster development in the country (Charles *et al.* 2009). Equally, public funds have become available in Romania, primarily from the Structural Funds, to ensure the development of the business sector, including cluster members (Chițu 2012 and Bogdan 2011).

Another interesting research study pertaining to cluster financing was a comparative study by Lämmer-Gamp*et al. (*2011). It explored 143 cluster organisations (where a cluster organisation is a managing and executive cluster unit, and all cluster representatives are not necessarily its members) in eight countries. The number of cluster organisations that participated in the primary research varied from country to country. Fifty-five cluster organisations came from Germany, twenty-six from Denmark, twenty from Poland, sixteen from Norway, eleven from Sweden, ten from Finland, four from Iceland, and one from Austria. As was shown in the research study, many of these organisations depended upon public finance, which they used to cover the wages and salaries of their employees, and the expenditures of their offices and equipment. The proportion of public funds in the overall cluster budget was to a great extent influenced by the representatives of cluster organisations and their individual personal preferences, as well as by the opportunity for cluster programmes to win support from the public sector in single countries. Clusters can be financed from various regional, national, or European funding programmes.

The majority of cluster organisations (seventy-seven out of one hundred and forty-three participating in the study) were at least 60% funded from public resources, the budgets in forty-three clusters were more than 80%dependent on public funds, and 19% of the cluster organisations' funds came from public finance in only in twenty-nine clusters.

Table 1 -Shares of public funds in the overall budget of a cluster organisation

Share of public funds in the overall budget of a cluster organisation	0-19%	20-39%	40-59%	60-79%	> 80%
Number of clusters	29	11	26	34	43

Source: Lämmer-Gamp *et al.* (2011)

Müller*et al.* (2012) perfectly complemented and extended the previous detailed survey when they explored a number of aspects of cluster existence in Europe, including matters of their financing. Their research included 261 clusters, where over 75% of clusters came from Germany (seventy-four clusters), France (seventy-three clusters), Denmark (thirty clusters), and Poland (twenty clusters). One of the issues the authors tackled was differences in cluster characteristics financed prevailingly (75% or more) from private sources from those financed prevailingly (again 75% or more) from public sources. Based on this research study, Müller *et al.* (2012) stated that clusters financed mainly privately (over 75%) occurred predominantly in the industrial sector and were highly specialised in a particular sector. The management structure of these clusters was mostly centralised. However, their financial situation generally seemed to be less stable and secure in comparison with clusters financed mainly by public funds. On the other hand, clusters financed largely by private funds were older and more successful when considering their influence or power. They had a greater influence on the research and activity development of

small and medium-sized enterprises, and also on the research and development of research institutes. As a result, they also had a great influence on business activities and internationalisation of small and medium-sized enterprises. The explanation of this phenomenon is quite clear: private investors have high expectations for return on their investment. Private funds are usually provided on contractual bases, the contracts stipulating the outcomes and objectives clusters must meet in addition to penalties in case of failure. In contrast, subsidy programmes typically define expected results but do not impose penalties for not achieving the defined results.

Furthermore, the authors studied a median of the share of public funds in the overall budget of cluster management organisations. In the majority of cases, cluster management organisations are responsible for the management and operation of clusters. The authors examined the proportion of public funds in the budgets of said organisations, which largely serve as a source of finance to cover the wages and salaries of cluster employees, their premises and equipment. The sources and shares of public funds depend to a large extent on cluster management organisation activities and objectives, the environment they operate in, as well as on the public funding programmes they draw finance from. The value of the median of public funds share in the overall budgets of cluster management organisations was 59.5% in Denmark, 57.5% in France, and 49.5% in Germany (Müller *et al.* 2012).

Similar scientific research conducted by Hantsch *et al.* (2013) analysed various aspects of cluster operation in Germany (sixty clusters), France (seventy-one clusters), and Norway (ten clusters), including their sources of revenue. The analysis was based on the results of benchmarking activities of the European Secretariat for Cluster Analysis. Since cluster initiatives are usually established by means of public co-funding, there is an intensive on-going debate on how much public funding is to be recommended and for what period of time. European countries follow very different approaches. The analysed clusters were allowed a possibility of making their own budget structures out of the below funds. The origin of the total budget for a cluster organisation is displayed in Table 2, where the following categories were distinguished: public funding, revenues generated from chargeable services, membership fees, and other private sources like private foundations, donations and/or any in-kind contributions (non-cash). It is considered that a certain part of the budget of the cluster organisation should come from private sources in order to provide a better financial sustainability for the medium and long term.

Table 2 - Cluster budgets in studied countries in %

COUNTRY	Number of clusters studied	Public funding	Membership fees	Revenues generated from chargeable services	Other private sources like private foundations, donations, etc.
Clusters in Germany	60	41	28	22	9
Clusters in France	71	59	18	8	15
Clusters in Norway	10	69	23	1	7

Source: Hantsch *et al.* (2013)

Meier zu Köcker and Müller (2015) analysed in detail numerous cluster programmes which currently present one of the main financing tools for clusters in Europe. Among other factors, they explored the funding structure by means of various cluster programmes. The programmes explored are still ongoing. The structure of cluster funding within the framework of these programmes varies from the complete public funding (as is in *Program Support Activities for the Development of the Tools foreseen by Smart Specialisation Strategy of Regione Lombardia*), through cluster programmes that are 90% publicly funded (such as *the National Cluster Platform Austria – NCPA*), 50% publicly and 50% privately funded (for example, in Norway - *Norwegian Innovation Clusters*), to cluster programmes that are more than 50% funded from private sources (for example, *Pôles de Compétitivité* in France).The shares of public and private funds in several cluster budgets are shown in the following table.

Table 3 - Funding of some selected national and regional cluster programmes in Europe

Country (region) and name of the programme	Term of the programme	Budget	The maximum amount of funding per cluster	Financing structure of projects
National cluster programmes				
Austria – National Cluster Platform Austria (NCPA)	2015-2020	22 million €	none	Public: regional funds: 40%, ERDF: 50%, Private (membership fees, sponsoring): 10%

Denmark - Innovation Networks Denmark	2010-2018	10 million € p.a.	around 1 million € p.a.	The public grant must be leveraged by at least as much funding from other sources. Private in-kind or in-cash contributions must equal at least 80% of the grant while the remainder may come from EU, regional or local sources.
France –Pôles de Compétitivité	2013-2018	450 million € for the first three years	5 million €	Public: state: 23%, Regional or local authorities: 20%, Private structures: 57%
Norway – Norwegian Innovation Clusters	2014 – ongoing	-	Three sub-programmes: Arena 375.000€, NCE 750.000 €, GCE 1.2 million €	Public: 50%, Private: 50%
Portugal - Competitiveness Clusters	2015 – 2020	-	none, depends on the instrument and type of incentive	Financing structure allows public funding typically ranging from 65% to 85% support
Sweden –VINNVÄXT - Regional Growth through Dynamic Innovation Systems	2002 – 2022	8.5 million € p.a.	1 million €	Max. 50% funding from the programme, min. 50% regional co-funding (cash funds or in-kind-contributions)
Regional cluster programmes				
Lower Austria (AT) - Cluster Program Lower Austria	2015 - 2020	22 million € for six years	No	Public: regional funds: 40%, ERDF: 50%, Private: membership fees, sponsoring: 10%
Region Lombardy- (IT) - Support activities for the development of the tools foreseen by Smart Specialisation Strategy of Regione Lombardia	2014 - 2016	complex programme which is fed gradually, no info available	100.000 €	Public: 100% (regional finance)
Region Asturias (ES) - Clusters Asturias	2008 - ongoing	250.000 €	125.000 €	Substantial contribution at the beginning from the local government. Temporary public funding for governance (maximum 10 years): Creation: 100% public funding, Governance: steady decrease in the level of public funding (max. 10 years - rate decrease 10%), Collaborative projects: 70% public funding

Source: Meier zu Köcker and Müller (2015)

3. Methodology and hypotheses

The paper is based on two independent questionnaire surveys carried out in 2011 and 2016. The goal of both surveys was to determine the budget structure of the clusters in question and the proportion of public and private funds in their budgets. The former survey took place in 2011. The extensive analysis of assorted sources on cluster organisations resulted in a long list of 834 entries from thirty-two European countries. The prospective clusters were addressed by the authors during the year 2011, while the addressed were primarily cluster facilitators. In total, 125 fully completed questionnaires from twenty-five European countries were collected. The response rate, when calculated from the population of potential clusters, was 14.99 %. The majority of responses were received from cluster representatives in the Czech Republic (seventeen), Germany (fourteen), Slovakia (fourteen), Hungary (twelve), Sweden (eight), Denmark (seven), and Spain (six). Four responses came from the cluster representatives in Austria, Italy, Norway, Poland, Romania, Switzerland and the UK respectively. Three responses were obtained from the Netherlands and Lithuania, while the other European countries delivered only a maximum of two responses (Urbančíková and Burger 2014, Urbančíková and Burger 2016).

The latter survey was carried out during the first half of 2016. The content of the questionnaires used was identical to those used five years beforehand. Again, a sample was drawn from European clusters. A total of 1,017 clusters out of twenty-nine European countries were invited to the survey. 119 completed questionnaires were obtained; hence the response rate was 11.70%. The greatest number of correctly answered questionnaires were

recorded in the Czech Republic (thirteen), Poland (eleven), Germany, Slovakia, Spainand Sweden (ten each), Hungary (seven), Norway and Italy (six each), Austria, Switzerland and Great Britain (five each), and Bulgaria, Denmark, Romania and Slovenia (four each). Other European countries delivered only two, one or no response.

The aim of this paper is to track changes in revenue structures in cluster budgets between 2011 and 2016 and to compare the shares of public and private funds in cluster budgets including those in their structures, as both public and private sources are composed of various types of revenues available to clusters. Clusters could make their budget structures from four different types of public and private sources (according to theoretical studies) most frequently employed in practice in cluster funding. At the same time, they were offered a possibility of selecting from "other sources" closely specifying which source it was. Despite having that possibility, none of the clusters decided for such an option in 2011 or 2016.

Public funds for clusters may be allocated from different government levels. The recent research studies (Rothgang *et al.* 2015, Lindqvist and Sölvell 2011, Barsoumian *et al.* 2011, Sölvell 2009, Pavelková *et al.* 2009, Santipolvut and Mali 2015, Urbančíková and Burger 2016) have served as the basis for the creation of a suitable method of classifying cluster financing within the system of public funds as follows: National budgets (national/governmental funds to finance cluster activities), Regional budgets (regional funds to finance cluster activities), Local budgets (municipal funds to support cluster activities), European Union budgets (EU funds to finance cluster activities).

Private funds studied in the research are categorised into four forms (Meier zu Köcker and Müller 2015, Hantsch *et al.* 2013, Lindqvist *et al.* 2013, and Spišáková 2010): membership fees of cluster members, revenues generated from the cluster´s own activities, credit instruments– bank loans, venture capital, "business angels" (crowd funding circles), and donor gifts. In order to pursue the goal stated, three hypotheses were proposed to be further confirmed or rejected.

H1: The share of private funds in cluster budgets increased in a statistically significant manner between 2011 and 2016.

H2: The differences identified in the shares of individual types of public and private funds in overall cluster budgets between 2011 and 2016 are statistically significant.

H3: The differences in the shares of individual types of private funds in overall cluster budgets between 2011 and 2016 are statistically significant.

The Mann-Whitney *U*-Test was applied to statistically process the data collected. Since the normality of distributions cannot be assumed in this case, this test provides a suitable non-parametric alternative to the parametric t-test on normal distributions. The test can be applied under the condition of random variables being independent and showing continuous probability distribution, which can be met in this case (Hudec *et al.* 2007). The Mann-Whitney *U*-Test is employed with ordinal (rank-order) data in a hypothesis testing situation involving a design with two independent samples/populations. If the result of the Mann-Whitney U-Test is significant, it indicates there is a significant difference between the medians of two populations, and as a result of the latter, the researchers can conclude that there is a high probability that the data sets represent populations with different medians (Sheskin 2007). The Mann-Whitney *U*-test belongs to more powerful non-parametric tests (Field 2005, Liptáková and Čonková 2011).

4. Comparison of changes in the shares of public and private funds in cluster budgets

Based on the surveys, the share of private funds in cluster budgets increased from 51.76% in 2011 to 57.18% in 2016, however, it remains debatable whether this change is statistically significant. As a result, the share of public funds in the budgets of investigated clusters decreased accordingly.

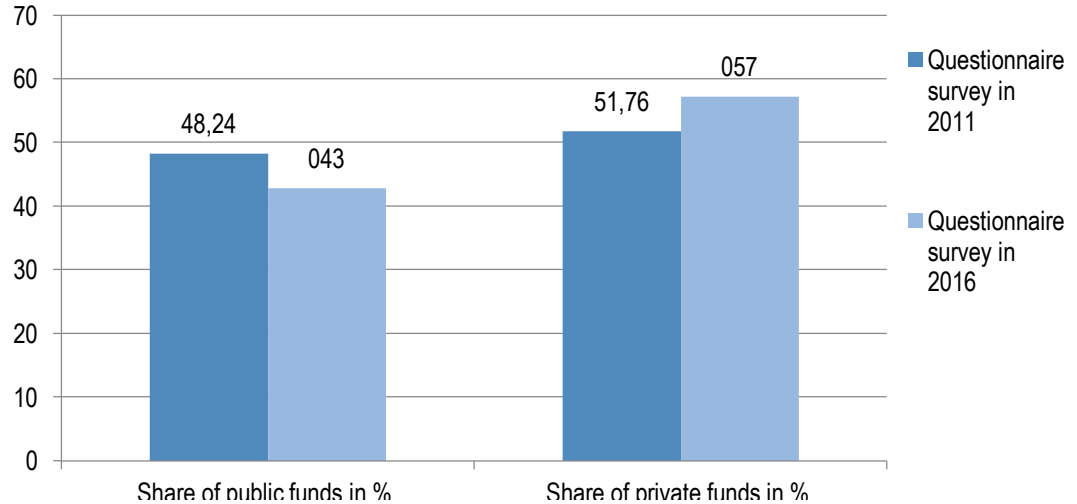

Figure 1 - Shares of public and private funds in cluster budgets in %

As can be seen from the following figure, when assessing the structure of public funds in cluster budgets it can be concluded that there were minimal changes between 2011 and 2016. The share of public funds in cluster budgets decreased from 48.24% in 2011 to 42.82% in 2016. The shares of the individual types of public funds decreased proportionally; never the less, these are by no means considerable differences between the figures obtained in 2011 and 2016. On the contrary, significant differences can be seen when analysing private funds, namely a dramatic decrease in the income from membership fees in cluster budgets (from 39.84% to 23.99%), and a marked increase in the clusters´ revenues generated from their own activities (from 10.96% to 25.13%). Credit instruments, *i.e.* funds obtained chiefly from bank loans, continue to participate marginally in cluster budgets, whereas venture capital resources, funds received from crowd funding circles such as "business angels", and gifts from various donors have been increasingly used in the last five years (0.08% in 2011 compared to 6.93% in 2016). In order to verify the statistical relevance of the data collected, it is necessary to compare the medians of both data sets. To this end, the most suitable method seems to be the aforementioned non-parametric Mann-Whitney *U*-test.

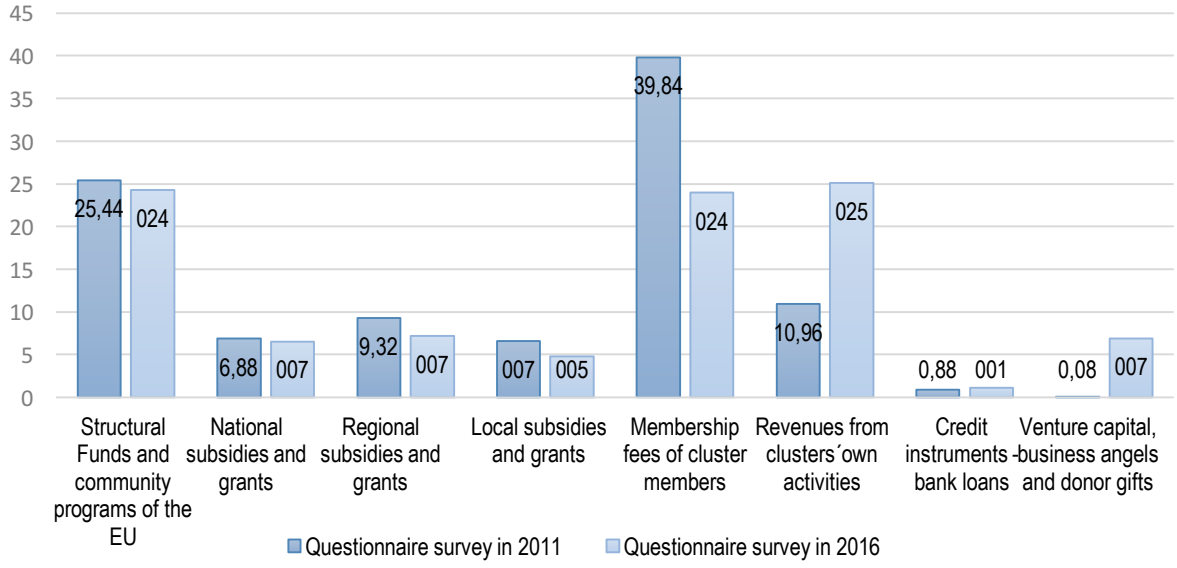

Figure 2 - Shares of the individual types of public and private funds in cluster budgets in %

Statistically significant differences were further explored by using the Mann-Whitney *U*-Test. Under the null hypothesis H_0 two independent populations – data sets (two questionnaire surveys of 2011 and 2016, independent

of each other) have equal medians. The alternative hypothesis H_1 means that two independent populations do not have equal medians, *i.e*. show a difference in medians and the difference identified are therefore statistically significant (Sheskin 2007).

Mann-Whitney tests

H_0: $\mu_1 = \mu_2$

H_1: $\mu_1 \neq \mu_2$

Table 4 - Comparison of the shares of public and private funds in cluster budgets

Public/Private sources	Year of questionnaire survey	No of clusters	Average rank	0.05 level of significance -minimum level of significance for the rejection of the null hypothesis	
Public funds	2011	125	128.38	p-value	0.180
	2016	119	116.32		
	Total	244			
0.180 > 0.05 H_0 is not rejected (the differences detected in the questionnaire surveys when comparing the shares of public funds in cluster budgets in 2011 and 2016 are not statistically significant).					
Private funds	2011	125	116.62	p-value	0.180
	2016	119	128.68		
	Total	244			
0.180 > 0.05 H_0 is not rejected (the differences detected in the questionnaire surveys when comparing the shares of private funds in cluster budgets in 2011 and 2016 are not statistically significant).					

Source: Authors based on the IBM SPSS Statistics outputs

Based on the Mann-Whitney *U*-Test, it is possible to conclude that the differences detected in the shares of public and private funds in cluster budgets in the primary surveys carried out in 2011 and 2016 are not statistically significant.

Mann-Whitney tests

H_0: $\mu_1 = \mu_2$

H_1: $\mu_1 \neq \mu_2$

Table 5 - Comparison of the individual types of public and private funds in cluster budgets

Type of public / private sources	Year of questionnaire survey	No clusters	Average rank	0.05 level of significance - minimum level of significance for the rejection of the null hypothesis	
Structural Funds and community programmes of the European Union	2011	125	122.98	p-value	0.912
	2016	119	122.00		
	Total	244			
0.912 > 0.05 H_0 is not rejected (the differences detected in the questionnaire surveys when comparing the shares of the Structural Funds and community programmes of EU in cluster budgets in 2011 and 2016 are not statistically significant).					
National/Central government subsidies and grants	2011	125	118.46	p-value	0.292
	2016	119	126.74		
	Total	244			
0.292 > 0.05 H_0 is not rejected (the differences detected in the questionnaire surveys when comparing the shares of national government subsidies and grants in cluster budgets in 2011 and 2016 are not statistically significant).					
Regional government subsidies and grants	2011	125	115.38	p-value	0.071
	2016	119	129.97		
	Total	244			
0.071 > 0.05 H_0 is not rejected (the differences detected in the questionnaire surveys when comparing the shares of regional government subsidies and grants in cluster budgets in 2011 and 2016 are not statistically significant).					
Local government subsidies and grants	2011	125	115,41	p-value	0,061
	2016	119	129,95		
	Total	244			
0.061 > 0.05 H_0 is not rejected (the differences detected in the questionnaire surveys when comparing the shares of local government subsidies and grants in cluster budgets in 2011 and 2016 are not statistically significant).					
Membership fees of cluster members	2011	125	135.70	p-value	0.003
	2016	119	108.63		
	Total	244			
0.003 < 0.05 H_0 is rejected (the differences detected in the questionnaire surveys when comparing the shares of membership fees of cluster members in cluster budgets in 2011 and 2016 are statistically significant).					
Cluster revenues generated from their own business activities	2011	125	94.26	p-value	0.000
	2016	119	152.16		
	Total	244			
0.000 < 0.05 H_0 is rejected (the differences detected in the questionnaire surveys when comparing the shares of cluster revenues generated from their own business activities in cluster budgets in 2011 and 2016 are statistically significant).					
Credit Instruments – bank loans	2011	125	122.30	p-value	0.910
	2016	119	122.71		
	Total	244			
0.910 > 0.05 H_0 is not rejected (the differences detected in the questionnaire surveys when comparing the shares of credit instruments – bank loans in cluster budgets in 2011 and 2016 are not statistically significant).					
Venture capital resources, resources from business angels' donor gifts	2011	125	103.93	p-value	0.000
	2016	119	142.00		
	Total	244			
0.000 < 0.05 H_0 is rejected (the differences detected in the questionnaire surveys when comparing the shares of venture capital resources, resources from business angles and donor gifts in cluster budgets in 2011and 2016 are statistically significant).					

Source: Authors based on the IBM SPSS Statistics outputs

Again, based on the Mann-Whitney *U*-Test, it is possible to conclude that the differences detected in the shares of the individual types of public funds (the Structural Funds and community programmes of the European Union, central government subsidies, regional government subsidies, and local government subsidies - provided by towns and municipalities) in cluster budgets in 2011 and 2016 are not statistically significant.

Nonetheless, when comparing the individual types of private funds in cluster budgets in 2011 and 2016, the situation is somewhat different. The primary surveys carried out in 2011 and 2016 have proved that the shares of the three types of private funds in cluster budgets (membership fees of cluster members, cluster revenues generated from their own business activities and the resources gained from venture capital, "business angels" and donor gifts) have changed and the changes detected are statistically significant.

Conclusion

The structure of the individual types of funds in cluster budgets has developed in an interesting manner over time. Shortly after defining clusters by Porter (1990), they mainly employed private resources to perform their

activities. Even today, the majority of clusters that came into existence before 2000 prefer private funds to public funds in their budgets unlike the clusters that developed after 2000 (Sölvell *et al.* 2003 and Müller *et al*. 2012). As a result, financial support provided for clusters in a number of countries in Europe and in the world, has become a useful and frequently-used tool to improve the competitiveness of these countries, especially within some of their specific regions. Several cluster programmes have been formed and which are still very successful and are still currently operating (for example, *Vinnväxt*in Sweden, *Pôles de Compétitivité* in France, etc.).The share of public funds seems to have stabilised over the last five years along with the changes in the structure of these in cluster budgets in Europe(the Structural Funds and community programmes of the European Union, central government subsidies, regional government subsidies, and local government subsidies), which are rather inconsiderable and statistically insignificant in comparison to private funds.

In contrast, the structure of private funds in cluster budgets has experienced significant change. Membership fees continue to play an important role, however, the majority of European clusters are able to gain just as much private funds into their budgets by selling their own products or rendering their own services. Many of the clusters operating in the IT sector have recently been generating more income from their own activities than by collecting membership fees. These revenues further reduce membership fees for the individual cluster members or make it possible to further develop the cluster. Similarly, the employment of resources from venture capital, crowd funding circles such as "business angels", and various donor gifts in European clusters has increased in the last five years, which to a large degree follows the pattern of American clusters that have been quite frequently employing such resources in their clusters since the 1990s (Alcazar*et al.* 2011, Muro and Katz 2010).

Three hypotheses were proposed in the paper. The first hypothesis assumed that „the share of private funds in cluster budgets statistically increased significantly in 2016 in comparison with 2011" and was shown to be untrue. According to the surveys, the share of private funds in the budgets of the clusters in question has increased slightly in the last five years; nevertheless, the identified differences are not statistically significant. The second hypothesis assuming that "the differences identified in the shares of individual types of public and private funds in overall cluster budgets between 2011 and 2016 are statistically significant" has been proved to be untrue as well. The changes that occurred in the structure of public funds in cluster budgets are minimal. A slight decrease in the individual types of such funds in the budget structures only follows the overall decrease of public funds in 2016 in general. Finally, the third hypothesis stating that "the differences in the shares of individual types of private funds in overall cluster budgets between 2011 and 2016 are statistically significant" holds true. Based on the 2016 survey, only one out of four types of private funds in cluster budgets – bank loans, the least frequently used source of finance, has not undergone significant change since 2011. The other three explored types of private funds have changed significantly. While the extent to which clusters financially depend on membership fees has dropped considerably, that fact being statistically significant, the extent of generating revenues from the clusters´ own activities as well as the access to venture capital and the resources from "business angels" and donor gifts have been significantly larger in the last five years. Based on both the 2011 and 2016 surveys, Hypothesis 3 can be confirmed. That points to the fact that clusters have recently restricted financing their activities by collecting higher membership fees and have put more effort in actively gaining their own resources by selling their products successfully and providing services for their customers more effectively, thus improving their competitiveness.

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Impact of Tax Burden on the Country's Investments

Ravil Gabdullaevich AKHMADEEV
Plekhanov Russian University of Economics, Moscow, Russia
ahm_rav@mail.ru

Mikhail Evgenievich KOSOV
Plekhanov Russian University of Economics, Moscow, Russia
kosovme@mail.ru

Olga Alekseevna BYKANOVA
Plekhanov Russian University of Economics, Moscow, Russia
bykanova@inbox.ru

Ksenia Valerievna EKIMOVA
Plekhanov Russian University of Economics, Moscow, Russia
ekimovak2003@yandex.ru

Svetlana Viktorovna FRUMINA
Financial University under the Government of the Russian Federation, Moscow, Russia
frumina@mail.ru

Natalia Vasilievna PHILIPPOVA
Plekhanov Russian University of Economics, Moscow, Russia
filippova25@mail.ru

Abstract:

The approaches to fiscal expansion and the corresponding methods are the same in most countries of the world. Depending on a specific task, the type of tax incentives may vary from country to country to increase their efficiency. Having analyzed the statistical data on all Russian enterprises (excluding small ones) for the period from 2008 to 2015, we deduced an equation y=0.0221x+0.3824 which describes the dynamics of the share of the enterprises investment in the total number of monetary assets. A positive value of the coefficient 0.0221 suggests that the volume of investments in the total number of monetary assets is increasing steadily. The government increases tax burden to ensure solvency and financial stability of the enterprises engaged in the development and implementation of investment projects. However, it should be noted that such decisions of tax regulation seem inconsistent. We have proved the hypothesis which explains to what extent tax burden on enterprises should be decreased to set the liquidity ratio and profitability at standard values (0.7 – 1), other conditions in the country being equal.

Keywords: investment in fixed assets, tax burden, tax incentives, investment projects, depreciation policy of the company.

JEL Classification: E 200, E 220, E 620.

1. Introduction

A detailed classification of tax incentives has been developed in the general theory of taxes taking into consideration taxation practices. One of the criteria in this classification is "the tax element which a tax incentive is aimed at". According to this criterion, tax incentives may be targeted to the taxpayer (tax exemption), the object of taxation (this type of tax incentive is called "bite of taxes"), the tax base ("tax deductions", "tax credit", "investment tax credit"), the tax rate (reduction of the tax rate), for the period of payment (postponement or paying tax in installments). Another criterion for granting tax incentives is a time period for which the exemption is available. Tax exemptions may be granted for a specified time period (tax holiday), or on a permanent basis without limitations on the incentive duration.

The analysis of foreign practices related to tax incentives provision showed that by present moment a set of specific tax incentives has been formed to encourage investment development. The approaches to fiscal expansion and the corresponding tax incentive tools are standard. However, depending on specific tasks, the types of tax incentives may vary from country to country, which increases their efficiency. For instance, the federal government is concerned with developing principles of division of public authorities' powers at various levels related to tax incentives. In this article let us consider several principles of division.

2. Concept headings

First one refers to codifying the right of a certain level of power to establish and provide tax incentives (reduced tax rate, tax relief, etc.), "one tax – one level of government". The functions of control over tax elements are implemented by one level of government. For example, value added tax is a federal tax and goes to the federal budget, property tax is a regional tax and is paid into the regional budget, personal property tax is a local tax and goes to local budgets.

Second principle implies the division of the right to establish and provide tax incentives for several levels of government, "one tax – two (three) levels of government". At the same time tax revenues are divided between the budgets of different levels of government, and the appropriate level of government can set its tax rate. For example, corporate income tax is divided between the federal budget and the budget of a sub-federal region, while the tax rate can be reduced at the regional level.

Thirdly, there is an exclusive right to establish and provide tax advantages to the federal level of government, with a parallel allocation of tax revenues between the budgets of different levels. For example, the personal income tax advantages are set at the federal level, but the amount of tax revenue is allocated between the regional and local budgets; advantages for certain types of excise goods are set at the federal level, but the amount of excise taxes are divided between the federal and regional budgets.

Comparative analysis of the levels of government with focus on tax incentives showed the dominance of the federal level. At the same time, the powers of the federal authorities are applied not only to federal tax incentives, but also to the incentives of regional and local taxes, which violates the principle "one tax – one level of government". Current Russian tax legislation allocates about 50% of the total incentives provided by regional and local taxes to the federal level. This leads to the loss of tax revenues in regional and local budgets, while the lack of mechanisms to monitor the use of incentives granted leads to inefficient results.

In this regard, empowerment of lower levels of government related to the management of the federal tax elements (within the sums allocated to the regional and local budgets) can enhance the interest of regional and local authorities in increasing the tax potential of the territory since this would facilitate substantial motivation to expand the revenue base of their budgets.

At the same time, revenues from corporate income tax depend on the general economic situation in the country, which makes them unstable, especially in the context of declining production. The amount of tax revenues depends on the financial result. Therefore, a region, especially the one with large city-forming enterprises, would have a notable irregularity in the distribution of the tax base, which will provide municipalities with large enterprises with more favorable conditions and will result in a breach of the principle of fiscal neutrality. Consequently, it would be inappropriate to relegate the corporate income tax to the local level of governance, mainly dealing with social issues.

To boost the effectiveness of tax incentives and to ensure the full implementation of their inherent regulatory capacity, it is necessary to comply with the principles of scientific development and provision of tax incentives. Methodological approaches to the selection, monitoring, and control over the use of tax incentives should be based on the general theory of taxation and international practices.

A sound fiscal policy of providing tax incentives for investment activities in general, as well as for selected priority investment projects, should be based on existing relations between the size of tax burden and financial appraisal of both individual investment projects and investment in general. The implementation of an investment project aims to achieve the following objectives: to obtain the rate of profit on capital and to achieve sound financial standing of enterprises (Figure 1).

Mathematical methods of interpolation enable to state the functional dependence which represents the relations between the studied parameters. Having analyzed the statistical data on all Russian enterprises (excluding small ones) for the period from 2008 to 2015, we deduced an equation $Y = 0.0021x + 0.3824$which describes the dynamics of the share of the enterprises investment in the total amount of monetary assets. The sign of the coefficient of the x variable defines whether economic indicators are rising or falling. A positive value of the coefficient 0.0221 suggests that the volume of investments in the total amount of monetary assets is steadily increasing. Solvency is a feature of the security of an investment project, provided by a high proportion of equity capital in the total amount of funds used by an enterprise. The solvency of an investment project is estimated by using a set of indicators, with finance and investment ratios being the crucial ones.

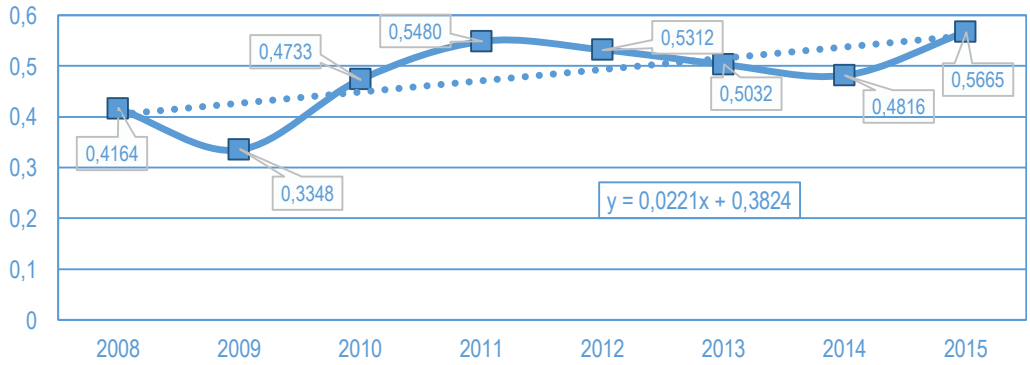

Figure 1 -The share of investments in the total amount of monetary assets for all Russia's enterprises (excluding small businesses)

Financing ratio shows how much of the investment project is financed with the owner's funds, and the investment ratio –what share of fixed assets is provided by the equity capital.

Thus, the following equation is used to calculate the investment ratio:

$$\mathrm{FR} = \mathrm{EQ}\ /\mathrm{BC}, \tag{1}$$

where EQ is equity capital, BC is borrowed capital,

The investment ratio is calculated by the equation:

$$\mathrm{IR} = \mathrm{EQ}\ /\mathrm{FA}, \tag{2}$$

where FA is fixed assets.

Return on invested capital describes the ratio of the volume of funds involved in the project (equity and credit) and the planned amount of net profit. The equation for calculating the return on invested capital (ROI) is as follows:

$$\mathrm{RIC}\ = \mathrm{NP}\ /(\mathrm{EQ} + \mathrm{LTD}), \tag{3}$$

where NP is net profit (profit after tax), OC is owner's capital, LTD is long-term liabilities.

Return on owner's capital allows evaluating the project regarding the use of the capital invested by the owners of the project and is calculated as:

$$\mathrm{ROE} = \mathrm{NP}\ /\mathrm{OC}, \tag{4}$$

The results of financial evaluation of the project performance are influenced, in varying degrees, by taxation (tax burden). Tax burden should be viewed as the ratio of the sum of all taxes due to the budget to the entity revenue. Supporting the experts' views on the use of the revenue as an integral indicator, the authors of the article believe that this indicator accurately reflects the financial capacity of an enterprise since it is the cash flow in the form of the entity's revenue that allows financing all its costs and taxes.

When assessing the relation between tax burden and the indicators of the financial evaluation of the investment project, one should develop a multi-criteria model built by correlative regression analysis. Here, economic and mathematical modeling of factors comprising the model of the relation of tax burden and financial indicators allows us to state the following dependence:

$$\mathrm{y} = \mathrm{f}(\mathrm{x}_1, \mathrm{x}_2, \ldots, \mathrm{x}_\mathrm{n}), \tag{5}$$

where y is the function of tax burden, $x_1, x_2, \ldots, x_n$ are dependent variables (factors).

At the same time, there is a close link between financial performance of the investment project (liquidity, solvency, profitability) and tax burden. Return on investment (X5) has the greatest impact on tax burden (Y), while indicators that describe the financial standing of an enterprise have the weakest connection.

Comparison of pair correlation coefficients of factor-arguments in their absolute values showed that there is no close relation between the groups of indicators, *i.e.* there is no multicollinearity. Thus, the selected factors may be included into a multi-model.

In practice, when doing statistical modeling of economic indicators, experts choose linear models or those that can be reduced to a linear form by converting the variables. Such a choice can be explained by the fact that mathematical apparatus of linear equations is the most developed one, and the models themselves can be interpreted more easily. At the same time, the use of nonlinear functions inevitably increases the number of parameters, reduces the accuracy of quantitative characteristics of the relations and complicates their interpretation.

When choosing the function type, one cannot ignore the fact that the limits of variation of correlated variables at a given place, time and size of the population vary within of the range of possible values, and only a linear function can wholly satisfactory approximate the relation.

$$y = A_0 + \sum_{i=1}^{n} A_i * x_{in}, \quad (6)$$

where y is tax burden, A_0 is intercept, $A_i$is regression coefficient, n is number of observations, $x_{in}$is factor.

Applying the linear form of connection between the function and the factors by constructing stepwise regression models with backward elimination, we obtain the following characteristic (Table 1).

Table 1 – Characteristic of the correlation ratio between the tax burden of enterprises implementing investment projects and their financial performance – factors.

	Y	X1*	X2*	X3*	X4*	X5*	X6*
Y	1	- 0.3076	- 0.2800	- 0.2051	- 0.2536	- 0.5252	- 0.3018
X1		1	0. 8253	0.1484	0.1502	0.2176	0.1986
X2			1	0.1189	0.1797	0.2088	0.1961
X3				1	0.7642	0.3688	0. 3620
X4					1	- 0.2855	- 0.3190
X5						1	- 0.8861
X6							1

Note: X1 - quick asset ratio, X2 - current liquidity ratio, X3 - financial ratio, X4 - investment ratio, X5 - return on investment, X6 - return on equity.

Thus, reducing tax burden is an effective tool to increase investments into the national economy, especially if the state uses fiscal expansion along with other measures of support.

3. Statistical methodology

Applying the stepwise regression method, one after another, the independent variables are included in the subset, according to a predetermined criterion. At the same time, some variable can be replaced with another variable that is not included in the set, or be removed from it. Thus, the economical set is composed on the basis of variables from an ordered list that have the highest predictive validity. Let us assume that a set of variables *C* already has *k* – variables where *k = 0, 1, 2, ... p-1*. Then the value *F* included for the variable *x* (not a member of the *C*) is calculated as follows:

$$F_{yx} = r_{yx}^2 * (n - k - 2)/(1 - r_{yx}^2), \quad (7)$$

where r_{yx}^2 is the pair correlation coefficient.

The stepwise elimination of the factors enabled us to obtain the models for a linear function of tax burden formation. After building a model with sufficient validity, we found significant terms of the equation by evaluating the regression coefficients using Student's t-test. Thus, the models of tax burden level formation for enterprises implementing investment projects and using simplified taxation scheme can be represented as $Y = -0.003 + 0.005\,X1 + 0.009\,X2 + 0.007\,X5$, and for enterprises implementing investment projects and using standard taxation scheme as:$Y = -0.001 + 0.0055\,X1 + 0.008\,X2 + 0.009\,X5$. For these equations, the regression coefficients show how tax burden changes after reduction (or increase) in this or that factor per unit of its physical indicator.

The mathematical relation between liquidity and tax burden can be expressed as follows:

$$FLC = \frac{AR+STI+M}{STLP+Ty} \quad (8)$$

where FLC is fast liquidity coefficient, AR is accounts receivable, STI is short time investments, M is money, STLP is short time loan proceeds, T_y is cumulative tax of an enterprise.

In this case, the total tax burden can be expressed as:

$$TS = \frac{Ty}{R} = \frac{\sum_i T_i}{R} = \frac{\sum_i t_i * B_i}{R} \quad (9)$$

where TS is tax stress, T_y is cumulative tax of an enterprise, R is return, B_i is tax base on *i* tax, $T_i = t_i * B_i$ is *i* tax from an enterprise, t_i is *i* tax rate.

Fast liquidity coefficient can be represented as:

$$FLC = \frac{AR+STI+M}{STLP+TS*R} \quad (10)$$

In this case, the equation representing tax burden and fast liquidity coefficient of enterprises will be expressed by the following dependence:

$$TS = \frac{1}{R} * \left(\frac{AR+STI+M}{FLC} - STLP\right) \quad (11)$$

It should be noted that the relation between the financing and investment coefficients is weak, which is proven by the above calculations of correlation. However, one can also see an indirect relation. Given that the equation for calculating the financial coefficient includes the borrowed capital which combines both long-term and short-term liabilities represented in the denominator of this indicator, it follows that the relation between the studied indicators will be an inverse one. Therefore, the larger the financial ratio is, the smaller is the tax due on the payment of taxes. The lower tax burden and the smaller tax due on the payment of taxes are, the higher the financial ratio is.

Similarly, one can find the relation between the investment ratio and tax burden. Given that the investment ratio shows what share of non-current assets is provided by equity capital, the relation between the studied indicators is also an inverse one. The greater the value of equity capital is, the greater the investment ratio is. In turn, the lower tax burden is, the greater is the value of equity, therefore, the higher is the investment ratio.

Here, the relation between tax burden and return on invested capital (ROI) is the closest one. In this case, ROI can be represented by the following equation:

$$ROI = \frac{\pi*(1-t)}{OC+LTD} = \frac{\pi*(1-t)}{I} \quad (12)$$

where ROI is return on investment, OC is owned capital, LTD is long time debt, I is investment.

Since π profit is the difference between revenues and costs, *i.e.* π = R-C, where *C* is Cost – the costs of an enterprise, *t* is tax rate, the equation relating the rate of ROI coefficient with tax burden can be expressed as follows:

$$TS = \frac{T_y}{R} \rightarrow R = \frac{T_y}{TS} \rightarrow \pi = \frac{T_y}{TS} - C \rightarrow ROI = \frac{\left(\frac{T_y}{TS} - C\right)*(1-t)}{OC+LTD} \quad (13)$$

Therefore, the equation (13) can be used to obtain an equation expressing tax burden through the ROI coefficient:

$$TS = \frac{T_y}{(ROI*I)/(1-t)+C}. \quad (14)$$

The found dependence shows the greater tax burden is, the less return on investment there is. In this case, the resulting mathematical relations allow us to predict the tax burden, depending on the liquidity ratio and the level of return on investment. At the same time, according to the international practice, the normal value of the coefficient ranges from 0.7 to 1. However, it may not be sufficient if a large share of liquid assets is made up by accounts receivable and they cannot be timely and easily recovered from the company's counterparties. A higher ratio should be used for such cases.

Hypothesis. Having analyzed the relations between the indicators, it is possible to make the following hypothesis: to what extent is it necessary to reduce tax burden of enterprises, so that liquidity ratio and profitability could be at the level of normative values (0.7 – 1), other conditions in the country being equal (Table 2).

Table 2 – Financial indicators for all enterprises in Russia (excluding small businesses), million rubles.

Year	Revenue for the fiscal period	Accounts receivable	Monetary assets	Short-term investments	Loan proceeds
2015	225386989	35736	7480716	113309.5	43493842
2014	175929063	31014	6449163	68799.0	36606035
2013	137323966	26264	5559856	63441.6	30809000
2012	107190201	22867	4793180	60711.8	25930000
2011	95008712	21797	4194481	59470.6	23064000
2010	77766329	18004	2955174	36377.5	19517000
2009	554000	15442	2401955	17881.6	17680000
2008	56206573	13783	2029007	21857.0	14826000

Comparative analysis of financial performance of Russian enterprises for the period of 2008-2015 allowed us to make the following conclusion. The government increases tax burden to ensure solvency and financial stability of the enterprises engaged in the development and implementation of investment projects. However, it should be noted that such decisions of tax regulation seem inconsistent.

The calculated investment ratios for different years of statistical survey set the general equation, which due to the fact that the coefficient of determination $R^2 = 0{,}025$, which is much less than 1, cannot be a determining element in the forecast for future periods. However, this relation can be used as a condition for determining a strategy of changing the level of tax burden in the economy at varying liquidity ratio 0.7-1. This dependence is shown in Figure 2 in more detail.

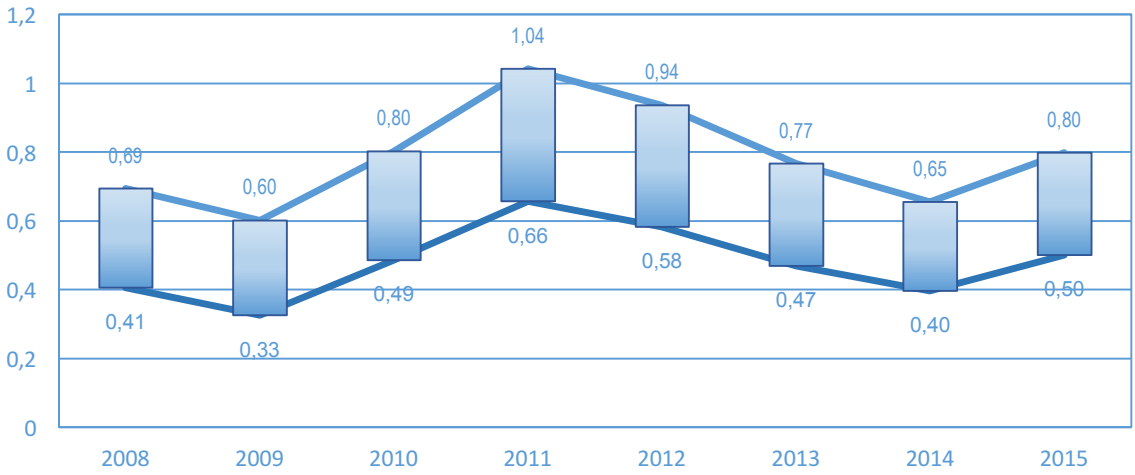

Figure 2 – Changes in the investment ratio of Russian enterprises

Reducing tax burden contributes to the growth of return on the investment project, liquidity, financial and investment ratios, as well as an increase in net profit from the implementation of the investment project. Identified quantitative characteristics of the studied dependences between tax burden and financial performance of investment projects are used to develop a single set of measures aimed at providing tax incentives for enterprises implementing investment projects.

4. Discussion

Having studied international practices, we can conclude that there is a large number of various tax incentives that stimulate investment development, including those which promote the development of certain regions and the tax support for implementation of certain large investment projects. Taking into account national specifics, this huge variety of tax incentives can be reduced to the following types: tax holidays, special tax rules set for special (free) economic zones, investment tax credits, investment tax deduction, accelerated depreciation, reduction of tax rates and tax exemption.

Tax holidays involve a temporary exemption of a taxpayer, working on an investment project, from payment of one or more taxes. Tax holidays generally include income tax and property tax levy. In addition, during tax holiday there may be certain loosening of administrative requirements, for example, relieving a taxpayer from the obligation to submit tax reports to tax authorities.

Some countries have a partial tax holiday, *i.e.,* reduction of tax liability of a taxpayer for a certain period of time rather than full tax exemption. Tax holidays are more often granted to newly established enterprises. For example, in Indonesia, the enterprises, newly created by foreign investment, receive tax exemption for 10 years. In China, in order to attract investments, tax holidays are granted to manufacturing companies that produce goods, semi-finished or innovative products and are planning to work in China for at least 10 years. These enterprises are exempt from paying income tax for two years from the date of the first profit, then for the next three years their taxable income shall be reduced by 50%. The USA established tax holidays on payroll budget as an anti-crisis measure.

Special (free) economic zones denote limited geographical area where, upon the registration, enterprises can get exemption from one or more taxes and/or reduce administrative requirements. Such zones are often export-oriented and are located close to the border, international ports and airports. It is interesting that in some countries certain companies can be declared "special zones" regardless of their location. For example, since 2004 France has a program "Poles of Competitiveness". The poles of competitiveness stand for the major scientific and industrial complexes that combine the functions of scientific and research institutions, educational institutions and high-tech enterprises in various sectors of economy, which encourages innovation and cooperation between enterprises. The program covers the following areas: environment, transport, energy, aeronautics, information technology, and nanotechnology.

The selection procedure for an innovative project to be included in the program encompasses the following steps: selection of the most relevant projects; approval of the application by the Finance Committee responsible for a specific "pole" (at this stage the Committee can make comments and adjustments on what incentives and subsidies the project can receive); approval of the project by ministries and agencies concerned. Having passed three stages of the project, participants receive the right to use the assigned privileges and other preferences. The poles of competitiveness are actively supported by the state: government subsidy; tax relief: full tax exemption for the first 3 years and alleviation of tax liabilities by 50% for the next 2 years; benefits covering payments to extra-budgetary funds (reducing the payments to 50% for small and medium-sized businesses, and 25% – for other enterprises).

Table 3 – Incentives granted to the representatives of the "poles of competitiveness" and their partners in France

Incentive rate	Comment
45%	For small and medium-sized enterprises with less than 250 employees, doing research and developing one
30%	For small and medium-sized enterprises with less than 250 employees, not integrated in R&D poles zone,
30%	For enterprises participating in technology transfer, and intermediary enterprises (from 250 to 2000
25%	For other enterprises

Tax incentive in the form of an investment credit implies that tax liability for income tax is reduced by a certain percentage of the sum a taxpayer spends on investment. Terms of the investment tax credit may differ regarding the provision of credit above tax liability and the possibility of transferring or returning it. The investment tax credit is most often given in case of investing in capital assets. Such an approach makes it possible to deduct the amount spent on the acquisition of fixed assets, expansion and reconstruction of production from the amount of the calculated income tax (in contrast to the usual allowances deducted from income or taxable income). This measure allows writing off a significant part of equipment costs in the first years of its operation.

Investment tax credit makes businesses more interested in increasing investment in new equipment from their own funds, and since the right to obtain deductions arises only after the commissioning of equipment, it also stimulates the faster development of new production assets. While increasing the overall investment of the enterprise, the investment tax credit is also an important driver of innovation as it effectively reduces the costs of investing in new, more high-quality equipment. Investment tax credit promotes innovation by encouraging the replacement of obsolete equipment with newer, especially involving IT solutions.

In turn, investment deduction drives a reduction in the taxable profits of some of the costs associated with investment. In contrast to the investment tax credit, investment deduction reduces the tax base of income tax, but not the calculated tax amount. For example, to stimulate innovation, in the UK companies are allowed to deduct the tax base for income tax by the amount of R and D costs: by 175% of the costs for small businesses; 130% – for large enterprises.

In addition to that, to stimulate investment and innovation of enterprises, the governments abroad often use tax incentives associated with allowances for depreciation. They are used to encourage faster growth of specific industries, to promote R and D and for the overall investment stimulation.

Accelerated depreciation implies writing off the cost ahead of the schedule provided for other property or assets used in other industries. This can be done in various ways, for example, by increasing of the depreciation in the first years of operation, or increasing the depreciation rate. There are no changes of tax payments in nominal terms, while their net present value is reduced, thus increasing the liquidity of the enterprise. For instance, the United States has the depreciation period of 5 years for equipment and devices used in R and D, with a service life varying from 4 to 10 years. In the UK, it is allowed to write off the full cost of technical equipment in the first year of operation (Table 4).

Table 4 – Accelerated depreciation of assets used in the research and development

Country	Depreciation rate and period
United Kingdom	100%
Canada	100% except for buildings and land
Germany	100% except for buildings and land
India	100% except for buildings and land, for pharmaceutical companies and companies developing biotechnologies – 150%
Italy	Machinery and equipment – 10 years of depreciation, 33 years for buildings
Greece	3 years
Mexico	100%
Spain	Buildings –10 years, machinery and equipment – “free” depreciation
Thailand	40% at the time of purchase, the rest – in accordance with the legislation

Some countries, along with accelerated depreciation, have a so-called “free” depreciation, which means that there is no clearly stated method of assets depreciation. “Free” depreciation allows even one-time 100% write-off of costs for research and development equipment.

Table 5 – Investment tax incentives granted to foreign investors in particular countries

Country	Incentives, % of the invested funds	Comment
Belgium	100	Incentives for investors.
Italy	210	Incentives for investors and tax holidays for 10 years.
United Kingdom	30	Incentives for investors creating jobs and training the staff. Accelerated depreciation and tax incentives.
Ireland	75	Incentives for investors creating jobs, and tax holidays for 11 years.
China	60	Reducing corporate tax rates and tax incentives on retained earnings.
Saudi Arabia	130	Tax holidays for 10 years.

In this regard, it is worth mentioning the services of “business angels”, widely used in the international practice, *i.e.* private investors, making direct investments in companies at the early stages of their development. Business angels frequently invest in innovative companies as these enterprises have the best chance of a high return. As a rule, investment is made in exchange for a share of the company. The value of this share varies in different countries. In Russia, it amounts to no less than a controlling interest; for European countries and the USA it may vary from 15 to 49% for 3 -7 years. There are 75 thousand business angels in the EU. The largest number of business angels can be found in the countries with a complex system of tax incentives for private investors, namely in France and the UK.

In international practice, fiscal expansion of business angels’ activities is most often implemented through reducing a tax rate on capital gains (approximately twofold reduction compared with the usual rate of income taxes) or total exemption from income tax on investments in companies. It should be noted that Russia has adopted a lot of international practices, taking into account the specifics of the national economy and tax system (investment tax credit, investment tax deduction, accelerated depreciation, etc.). However, the international practices of tax

incentives in the field of investment activities are still one of Russia's concerns. Here, it is worth mentioning tax incentives provided to business angels.

Conclusion

In the twenty first century, the issue of economic growth remains the most important problem of the market economy. Attracting investment in the economy is the main prerequisite for ensuring economic growth. For Russia, the issues of economic growth, expanding the investment activities are inextricably linked with the high level of fixed assets depreciation. Index of basic production assets (BPA) depreciation in Russia, according to the international economic associations, is at least 50%. Russian federal authorities estimate this figure at 45-65%, and the Russian Federation research centers as at least 60-65%. So, the BPA wear rate exceeds the critical value, which leads to a decline in production in most Russian industries.

Over recent years, Russia has shown a positive trend in the fixed assets renewal, and along with this, there has been an increase in investment activity in almost all industries. In turn, this has led to the fact that in 2012 the rate of fixed assets renewal exceeded the retirement rate for all types of economic activity. However, the degree of fixed assets depreciation in different industries remains relatively high, remaining almost the same over the last years (Table 6).

Table 6 – Characteristics of the fixed assets wear rate

INDICATOR	Wear rate	Renewal rate	Retirement rate
For All Organizations	48.1	3.9	0.7
Agriculture, Hunting and Forestry	43.9	4.1	2.4
Fishing, Fish Farming	65.2	2.8	1.6
Mining	51.3	5.3	0.9
Manufacturing	48.0	5.9	0.9
Production and Electricity, Gas and Water Supply	47.9	4.2	0.4
Construction	50.6	4.8	2.0
Wholesale and Retail Trade; Repair of Cars, Motorcycles, Household and Personal Use Items	40.5	6.3	1.0
Hotels and Restaurants	42.8	3.5	1.3
Transport and Communications	56.6	3.3	0.4
Financial Activities	42.4	8.8	0.7
Operations with Real Estate, Renting,	36.3	2.2	0.4
Public Administration and Defence; Social Welfare	53.7	6.9	1.3
Education	54.4	3.5	0.6
Health and Social	52.8	4.7	1.3
Other Community, Social and Personal Services	45.4	4.7	0.9

Having analyzed the international practices aimed at creating favorable tax climate for investment in a county, we can draw the following conclusion.

First, despite the increase in investment, Russia still demonstrates one of the world's highest levels of fixed assets depreciation, which directly influences the volume and quality of Russia's products, their competitiveness, production costs and the efficiency of enterprises (Figure 3).

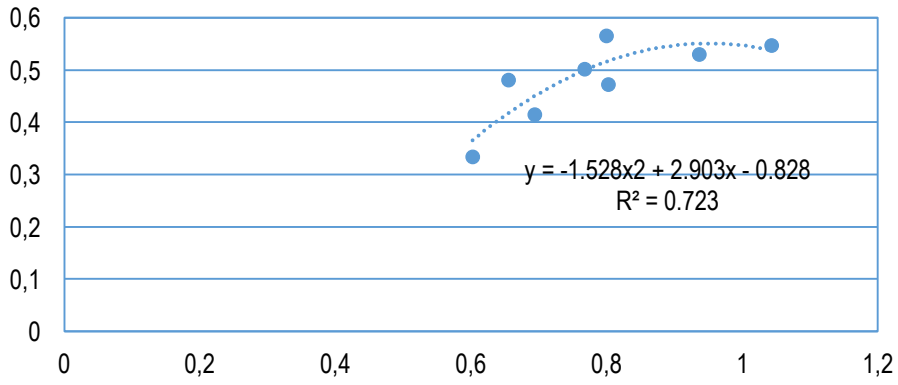

Figure 3 – The ratio of tax burden and the increase in investments in Russia

The value of the coefficient $R^2 = 0{,}7235$ *indicates* a relatively high accuracy of the resulting equation of the following function$y = -1{,}5x^2 + 2{,}9x\text{-}0{,}8$, which describes the dependence between the volume of investments made by enterprises and the level of tax burden in the country. When a critical indicator of tax burden in the country reaches 0.95 (granted that profitability rate equals 0.7), the volume of investments decreases and the process becomes irreversible. Therefore, this equation provided us with a necessary and sufficient condition that is required to determine the future strategy of the state with focus on increasing the volume of funds raised.

Second, the factors that hinder investment activities in the regions are the following: the lack of their own funds, sporadic activities aiming to improve and adjust the investment policy of the region, the lack of mechanisms (incentives), stimulating the regional authorities to attract investment; the lack of medium and small foreign investors which affects the stability and sustainability of investment inflows. Using the method of linear interpolation, it is possible to obtain a mid-term forecast on changes in the investment structure in various types. This refers to fixed investment, investment in residential and nonresidential building construction, investment in transport and equipment, as well as other types of investments (Figure 4).

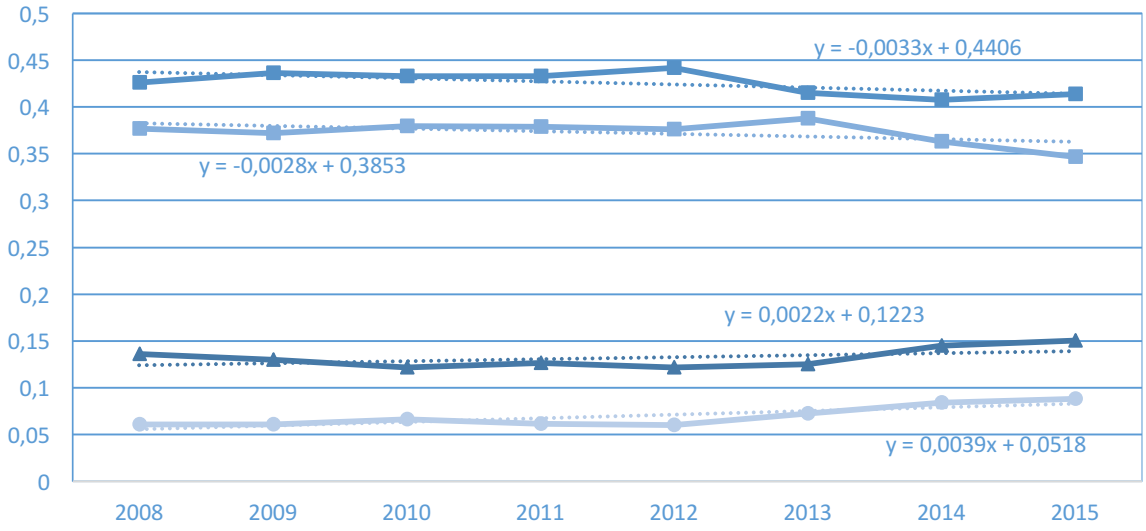

Figure 4 – Changes in the share of investment allocated by enterprises for their various types

Positive values of the coefficient in the equations$y = 0.0022x + 0.1223$ and $y = 0.0039x + 0.0518$identify the positive trend to an increase in investment in buildings and facilities, as well as other types for the Russian economy over the period of 2008–2015. At the same time, the negative values of the coefficient in the equations $y = -0.0033x + 0.4606$and $y = -0.0028x + 0.3853$ illustrate the trend of a decreasing interest in investments in fixed capital and housing, as well as in transport and equipment for the same period. In addition to that, the lack of financial resources, especially at the regional level, remains one of the most painful problems still unresolved. This impedes optimization of the structure of currently available investment sources and results in underdevelopment of debt financing procedures and economic instability as a whole.

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Dropshipping: Accounting and Mathematical Models

Anca Mădălina BOGDAN
Faculty of Juridical, Economical and Administrative Sciences Craiova
Spiru Haret University, Romania
am2bogdan@gmail.com

Cristina POPÎRLAN
University of Craiova, Department of Informatics, Romania
cpopirlan@gmail.com

Abstract

The aim of this article is to present the accounting benefits of drop-shipping type transactions, transactions adopted by more and more online retail merchants.

The greatest disadvantage of this transaction is that inventory is centralized at the supplier/manufacturer and therefore, the risk of loss of inventory and control over transactions upon it, while the seller is responsible for the product marketing, customer acquisition and delivery costs. Because of this accounting problem, the seller is obliged to pursue the profit for each order, he having advantages only if the price of the supplier does not increase and if the delivery costs do not change. The vendor must also know the optimal amount he must sell for profit.

Due to a business environment situated within a permanent change because of the economical crisis, entrepreneurs need to promote electronic commerce and optimal solutions for accounting for a rising profit. To streamline dropshipping transactions, we proposed a model for calculating the optimal quantity of the sold products and a registration into accounting of the dropship bill modality.

Key-words: e-commerce, dropshipping, accounting, optimal order, mathematical model, accounting records.

JEL Classification: C61, M41.

1. Introduction

Participation in e-commerce of the firms and the quick adaptation to changing markets, have become a necessity due to competitive pressure made by new firms. A decrease of the costs and improve customer service with e-commerce is no longer an option for the smallest and medium enterprises, but relates directly to their continued existence on the market.

Electronic commerce generates overall entity lower cost than if they tried to improve the cost structure starting from its components. Regarding the competitive mechanism, such changes lead to a market economy, to major shifts. Electronic commerce or e-commerce refers to a wide range of online business activities for goods and services. It also pertains to "any form of business transaction in which the parties interact electronically rather than by physical exchanges or direct physical contact" (Khurana, Goel, Singh and Bhutani 2011).

E-commerce is the sale of products and/or services via Internet and the use of electronic communications and digital information processing technology in business transactions to create, transform, and redefine relationships for value creation between or among organizations, and between organizations and individuals (Khurana, Goel, Singh and Bhutani 2011).

Dropshipping is a method of electronic retail sale through an online store, which does not store the products they sell. If the store sells a product, it acquires the element from a third party and delivers it directly to the customer. As a result, the trader does not come into direct contact with the product.

The biggest difference between dropshipping and standard retail model is that the merchant does not hold an inventory (Granai 2008). Instead, the trader buys the products according to the demand from a third party - usually an en-Grossiste or producer - to meet orders (Gan, Sethi and Zhou 2010).

Although in this study we treat a specific form of B2C (business to consumer) and dropshipping, we consider it important to emphasize the role and place it between the other types of e-commerce:

- *Collaborative commerce (C-commerce).* In this type of e-commerce, business partners collaborate electronically. Such collaboration frequently occurs between and among business partners along the supply chain.
- *Business to consumers (B2C).* In this case, the sellers are organizations, the buyers are individuals.
- *Consumers to businesses (C2B).* In this case consumers make known a particular need for a product or service, and organizations *compete* to provide the product or service to consumers. (An example would be Priceline.com, where the customer names the price and suppliers try to fulfil it.)

- *Consumer to consumer (C2C).* In this case an individual sells the products (or services) to other individuals.
- *Intrabusiness (intraorganizational) commerce.* In this case an organization uses e-commerce internally to improve its operations. A special case of this is known as B2E (business to its employees) e-commerce.
- *Government to citizens (G2C) and to others.* In this case the government provides services to its citizens via e-commerce technologies. Governments can do business with other governments (G 2G) as well as with businesses (G2B).
- *Mobile commerce (m-commerce).* When e-commerce is done in a wireless environment, such as using cell phones to access the Internet, we call it *m-commerce*.

Dropshipping is often defined as an easy way to get into the e-commerce business. You set up a store and whenever an order comes in, you simply email the supplier. They package up the item and ship it to your "customer", and you keep the profit. You never even have to spend time or money keeping and tracking physical inventory. This sounds great in theory. But like all formulas that promise to print money, this one is too good to be true. There are certain reasons why success in this branch of trade is not as easy to achieve as it sounds, some of which are presented in Table 1.

Table 1 - Benefits and limitations of dropshipping

Benefits of dropshipping	Limitations of dropshipping
Non-physical inventory	Low certainty of the product's condition
No stocking requirements	Incertain stock status
Unlimited product variety	Difficult perisable product and goods shipping
Low human resources	Difficult clientele development
Small maintenance cost	High Shipping Costs
Easy acces to information via Internet	Shipping Delays
Flexible working program	Large orders may block their delivery
Marketing investments required rather than inventory investments	Time spending and high costs for product promotion

Source: authors' contributions

There are certain conditions that state the economical superiority of dropshipping next to the traditional means of distribution. Though the fact that dropshipping is growing as a distribution system, there are cases when adopting this apparatus is not the best economical choice for the channel members. Sometimes only the manufacturer would favour dropshipping (Özer and Wei 2006). The inefficiency of the traditional system is caused by the lack of coordination so dropshipping comes as a second option where the lot-sizing decision is made by the manufacturer.

Dropshipping can be an easy way to get started selling online. But always remember that dropshipping isn't a magic formula to make you rich. Building a business does take a certain amount of hard work, and this is no exception. The real "magic" is that dropshipping allows you to invest your money in marketing rather than inventory. A well-planned marketing strategy is what will ultimately help you build a lucrative income (Granai 2008).

2. Dropship accounting

Accounting records of the transactions in e-commerce goods, dropshipping, is based on documents used in traditional commerce. Thus, the purchase of goods from suppliers is made on account, notice followed by an invoice accompanying goods, invoice and customs declaration for import external, depending on the type of provider.

In case of sale of goods billed with or without VAT, if the company carrying out this trade is registered for VAT, depending on the nature of delivery, respectively local delivery, intra-Community delivery in third countries and the quality grantee taxable or non-taxable for VAT purposes (Bogdan 2009).

If goods are sent to customers by courier and are paid to dispatch, then the courier company will give receipt to-refundable cash amounts received from customers. Between the company and the courier company, settlement amounts can be made optional with invoice settlement (Bogdan 2007).

For trade in the EU, the following records of transactions of dropshipping are made: if the transaction is subject to VAT, VAT invoice will be issued and the delivery is considered as national sales.

- Purchase goods from suppliers:

%	=	401
371		"Suppliers"
"Goods"		
4426		
"VAT deductible"		

- Payment of invoices from suppliers to purchase goods:

401	=	5121
" Suppliers"		"RON bank accounts"

- Recording the commercial related added value:

371	=	%
"Goods"		378
		"Price differences in goods"
		4428
		"Undue VAT"

- Delivery of goods to customers. Typically, the transport is performed by courier or mail, the transport being supported by the customer or supplier, depending on order value:

4111	=	%
"Clients"		707
		"Revenue from sale of goods"
		708
		"Income from various"
		4427
		"VAT collected"

- Decrease from freight management of stock sold goods:

%	=	371
607		"Goods"
"Expenditure on goods"		
378		
"Price differences in goods"		
4428		
"Undue VAT"		

- Receipt of courier shipping bill for the services provided:

624	=	401
"Expenditure on transport"		" Suppliers"

- Payment service provider transport:

401	=	5121
" Suppliers"		"RON bank accounts"

By dropshipping we understand an agreement between an e-tailer that holds no inventory to process orders and send the request to the manufacturer to ship the products directly to the costumer.

In order to observe the profitability and efficiency of the drop-shipping phenomenon comparing it to the traditional ways, the Economic Order Quantity (Battini, Persona and Sgarbossa 2014) was developed with pricing and lot-sizing decisions so that the interactions between the manufacturer and its retailer or e-tailer within the traditional or drop-shipping distribution system would be more transparent.

3. Mathematical method of dropshipping

To achieve those goals, companies must be able to build a unique resource system that supports their value propositions and product or service offerings. In addition, companies need to understand the impact of e-commerce that has redefined a company or industry's competitive advantages and be able to formulate and implement competitive strategies to gain and sustain new competitive advantages in the digital economy (Turban 2008).

The economic order quantity (EOQ) is a well know model that is used to calculate the optimal quantity that can be purchased or produced to minimize the cost of both the carrying inventory and the processing of purchase orders or production set-ups. The EOQ model is derived from the formula:

Total cost = purchase cost + ordering cost + shipping cost

The model is one of the oldest (introduced in 1913 by F. Harris) and simplest models in the literature. Because the model does not have an adjustable formula, it must be periodically recomputed for the entire company. The EOQ model (Porteus 1985) can be described using the following formula:

$$Q^* = \sqrt{\frac{2DS}{H}} \tag{1}$$

where Q represents the optimal order quantity, D represents the annual demand, S represents the cost incurred to place a single order or setup and H represents the cost per unit.

The final formula from the EOQ economic model is formed using the following assumptions: the average inventory is calculated by half of Q; the total number of orders made in a year is calculated by annual consumption divided by the order quantity; annual ordering cost represents the number of orders multiply by order costs.

In order to obtain a successful implementation of the EOQ model, the demands must remain constant over the year, the inventory level must be positive (modifications are needed when the inventory level reaches zero) and all the items are in perfect condition (Marimon and Llach 2013). The costs and the demands used in the simulation model are replaced by the proposed mathematical model, and they are, in fact, approximations (Van der Veen and Venugopal 2014). The profit is calculated as the sum of revenue generated minus order cost, purchase cost, and shipping cost during the time period.

In the EOQ model (Kannan, Grigore, Devika and Senthilkumar 2013) some values remain constant during the simulation: the ordering cost, the demand rate, the lead-time is fixed, no discounts are available, the purchase price is constant for every order, the stocks are automatically refilled (never go to zero).

In the simulation of dropshipping model we define two important categories: ordering costs (include communication of order, advertising, etc.) and carrying costs. If we want minimum carrying costs, we have to place small orders, because, usually, carrying costs raise the value of the order. In our simulation, we need to minimize the total inventory costs by using the EOQ model.

Total inventory costs = Ordering costs + Shipping costs

By using the EOQ model, the companies can minimize the costs associated with the ordering and inventory shipping. Let us consider the *following example:* Annual Demand Quantity of the Product 2.400 units, Purchase Cost per Unit 4,00 ron, Fixed Cost per Order 16,00 ron, Annual Shipping Cost per Unit 0,25 ron Using the mathematical model EOQ with the above proposed dates, we get to the following results, shown graphically in Figure 1 and in Figure 2.

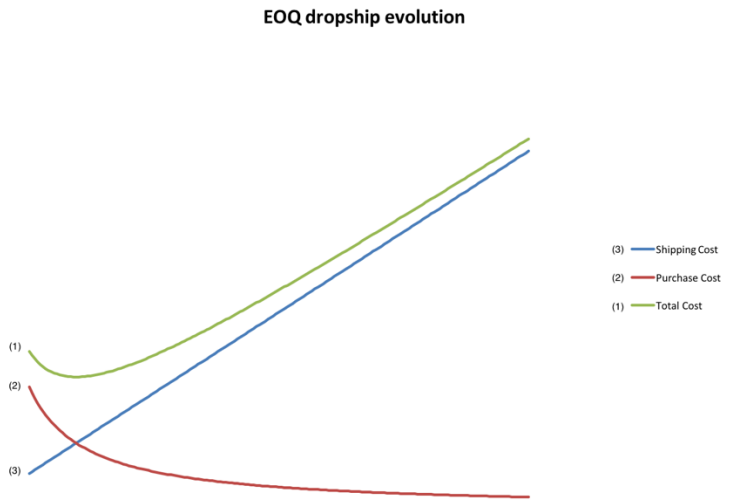

Figure 1 - EOQ Dropship evolution

It is noted that dropshipping transactions have an upward trend in the cost of transport (shown in Figure 1 in line (3)), due to fluctuating commercial markets and small orders (shipping cost deducting the large orders). Dropshipping company aim, in order to have an upward profit, for the decrease of acquisition costs to compensate for the rising cost of transport, which is shown in Figure 1 by the downward curve (2).

In conclusion, it can be seen that the compensation of the two types of expenditure fails to strike the balance and that the costs have an upward trend overall transaction, which is shown in Figure 1 by the (1) curve representing the total cost.

In dropship type transaction, it is not enough just to know transport and purchase costs. It is imperative to permanently know the size of the inventory of goods, as this type of companies do not have large spaces for storage of goods or orders received. For this reason, we have made a graphic presentation of the inventory level for the previously proposed data, illustratively proved in Figure 2.

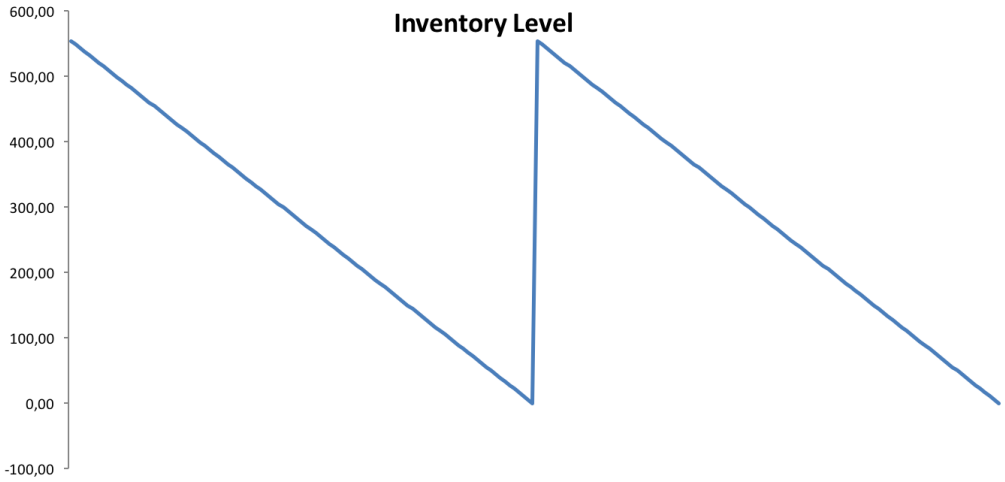

Figure 2 - Evolution of the inventory in dropship transactions

It is noted that the inventory level is fluctuating in dropship transactions, due to permanent change of the order structure. This is especially influenced by transport companies that cannot immediately honour the received orders.

If we increase the cost per order to 40 ron, we obtain the results represented in Figure 3. It can be noticed that if we increase the cost per order, an upward trend within the transport cost will be kept (shown in Figure 3 in (3) line). The acquisition cost decrease in order to compensate the increase of the transportation costs, and this is represented in Figure 3 by the (2) curve.

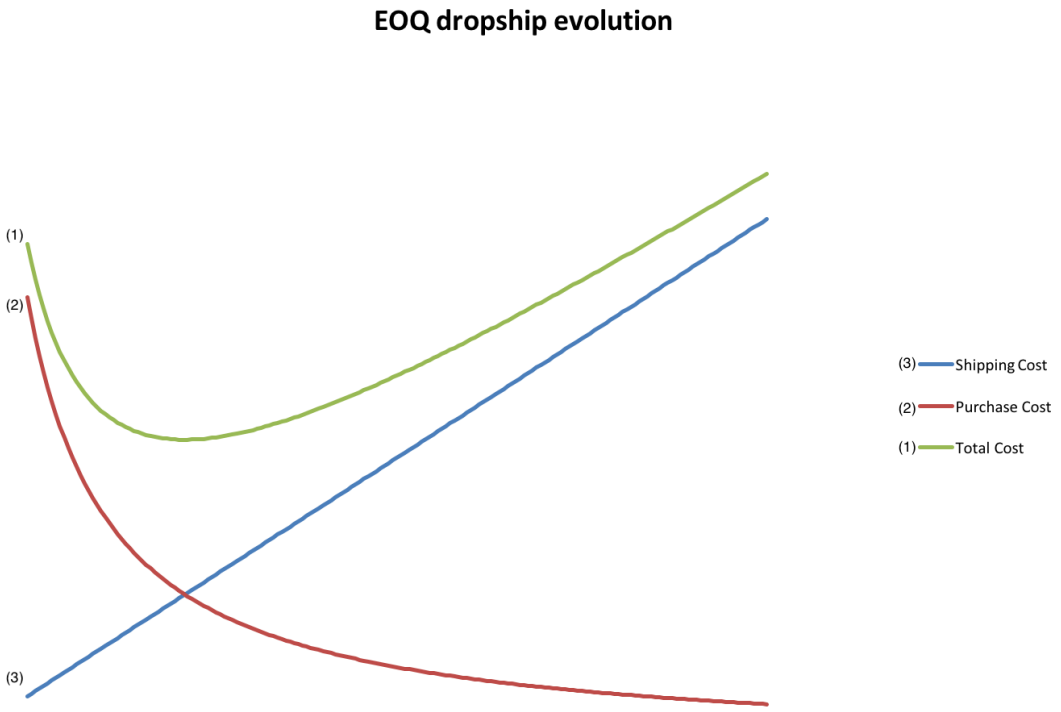

Figure 3 – EOQ dropship evolution for a 40 ron cost per order

In conclusion, it can be seen that the compensation of the two types of expenditure fails to strike the balance and that the costs have an upward trend overall transaction, which is shown in Figure 3 by the curve (1) representing the total cost, but manage to strike a profitable balance for the company.

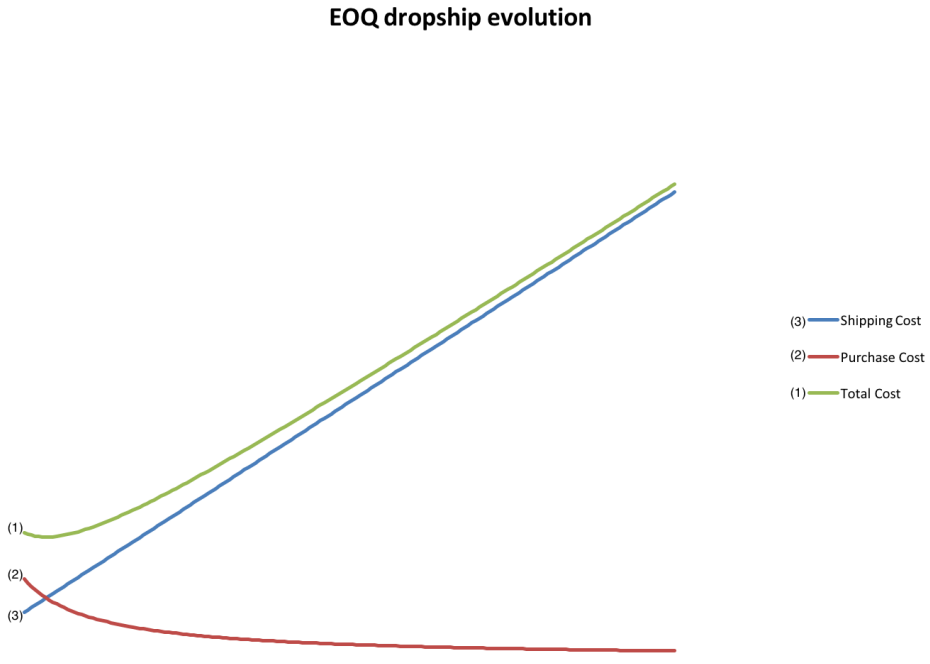

Figure 4 – EOQ dropship evolution for 8 ron cost per order

The economic order quantity is represented in the Figures 1, 3, 4, at the intersection of shipping cost line and ordering cost line. If we decrease the cost per order to 8 ron, we obtain the results presented in Figure 4. By reducing high cost per order value, an upward trend in the cost of transport will be kept (shown in Figure 4 in (3) line). Acquisition costs decrease very little, failing to offset the rising cost of transport, which is shown in Figure 4 by the (2) curve. In conclusion, it can be seen that the decrease in cost per order leads to an upward overall

transaction costs trend, as shown in Figure 4 by the curve (1), but the balance point achieved is not profitable for the company.

It is interesting to study this evolution dropship transactions (model) and to consider what happens if: order processing is automated; product cost is reduced during the year; a competitive product is marketed; delay becomes larger; a minimum order amount is required. The mathematical model proposed in this research can be successfully used by companies to be able to track items of transactions and how they influence profit growth.

Conclusions

The motivation for this research is drawn from the idea that everyone, especially youth, is chasing an easy way, no cost, no "registry", without major obligations but to obtain a huge profit. But nobody thinks that, in general, what is easy is outdated. Regarding dropshipping transactions, it seems relatively easy to get and launch such a firm. There is the possibility to open a site that runs selling the latest products, buyers launch online orders at any time of the day and night, so that, as vendor, you shall not be connected non-stop with the seller.

The question is: Why should your site visitors buy from you and not from other 100 sites that sell the same product? Maybe if you provide quality guarantee, if you could guarantee a rapid distribution, your business would be a priority for the customer. But it is hard to get distinguished from the existing products in thousands of other sites. As shown in this research study, to cheapen the value of orders, there is not a solution because you will be selling and loosing. There is always someone willing to sell cheaper, and margins on elements that can be distributed via dropship may be too small to start a business with them. You do not have too much flexibility.

In our opinion, to do dropshipping correctly, you will need to write unique descriptions per product. It takes time and/or money, even more than if you were selling products truly unique.

From the study, we conducted, we found that the most important elements influencing the order and the profit are the shipping costs and even the time spent lifting and delivering the orders. These issues must be clearly defined when concluding contracts with transport companies so that unprofitable business development gaps fail to appear.

In conclusion, through the conducted study, we demonstrated that the essential factor for profitable dropshipping business type is determined by establishing an *optimal point* between transport costs and acquisition costs for each transaction. This aspect can be revealed most efficiently by using the mathematical model proposed in this research paper.

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