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FOREIGN AID AND ECONOMIC GROWTH: LESSONS FOR PAKISTAN

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Abstract

Even after more than sixty years of foreign aid flows of US$ 88325 million from various countries aimed to boost economic growth, still every third Pakistani lives below the poverty line. This study used the Error Correction Model (ECM) to revisit whether foreign aid contributed to economic growth in Pakistan over the period 1972 through 2012. Empirical results support the existence of a significant negative relationship between foreign aid and economic growth. The study makes a valuable addition to the body of literature on the impact of foreign aid on economic growth. The results are expected to guide policymakers with regards to the impact of foreign aid flows on Pakistan economic growth and development.

Keywords: foreign aid, trade, poverty, economic growth, Pakistan.

JEL Classification: C32, F35, I30, O19, O40

1. Introduction

The inflow of foreign aid to developing countries[1] is a subject of hot debate among economists and politicians. The term foreign aid[2] suggests that it be given on humanitarian ground to give relief to people suffering from famines or other natural disasters (i.e., earthquakes, floods and other natural calamities). It is also used to expanding access to basic education and health care, reducing poverty, limiting weapons proliferation, curtailing drug production and strengthening allies in order to boost economic growth and development.

The proponents of foreign aid affirm that inflow of foreign capital is vital for economic growth and development in developing countries. They believe that foreign aid complements domestic resources as well as supplements domestic savings to fill the saving-investment and foreign exchange gaps by the provision of extra financial resources to developing countries. Apart from filling these gaps, it also provides access to modern technology, managerial skills and global markets (Chenery & Strout, 1966; Papanek, 1973; Hjertholm *et al.*, 1998). According to Azam *et al.* (1999) grants and concessional loans represent an important source of finance for low-income developing countries. In the traditional macroeconomic view, these inflows contribute to long-run development by releasing bottlenecks associated with low incomes.

Foreign aid provides additional financing. Morrissey (2001) has identified that there are many mechanisms through which aid can contribute to growth i.e., it increases investment in physical and human capital, it also enhances the capacity to import capital goods or technology. In addition, foreign aid does not have indirect effects that reduce investment or savings rates, and it is linked with technology transfer that increases the productivity of capital and encourages endogenous technical change. Aid remains a key tool for enhancing the development prospects of poor countries (Arndt *et al.*, 2010). Mustafa and Razak (2012) asserted that foreign aid is considered to be necessary and beneficial to developing countries, particularly in the areas of encouraging growth, poverty-reduction, increasing investment, human capital development and supporting good governance.

On the other hand, the opponents of foreign aid suggest that it has no effect on economic growth at best it makes the process of economic growth sluggish in the recipient countries. Further, Boone (1996) explicitly described that aid does not promote economic development because poverty is not caused by capital shortage and it is not optimal for politicians to adjust distortionary policies when they receive aid flows. The poison of aid has led to economic distortion and dependency. Aid corrupted even good men such as Zambia's Kenneth Kaunda. Aid to Africa increased from 5 percent to 17 percent of Gross Domestic Product (GDP) in the late 1990s, while, GDP growth actually decreased from 2 to zero percent or negative growth. It shows that aid does not contribute to economic growth (Jenkins, 2002).A former United States (US) aid official William S. Gaud (1968) expressed that: "The biggest single misconception about the foreign aid program is that we send money abroad.

We don't. Foreign aid consists of American equipment, raw materials, expert services and food - all provided for specific development projects which we ourselves review and approve. Ninety three percent of aid (US ODA program) funds are spent directly in the U.S. to pay for these things. Just last year some 4000 American firms in 50 states received US$ 1.3 billion in aid funds for products supplied as part of the foreign aid program."

International capital flows are growing rapidly. Overall, the official development assistance (ODA)[3] has increased from around US$ 40 billion a year in the 1960s to over US$125.5 billion in 2011. Afghanistan accounted for 7 percent of all ODA over the period from 2009-2011; six other countries such as Democratic Republic of Congo, Ethiopia, Vietnam, Pakistan, India, Tanzania, and West Bank & Gaza Strip each received more than 2 percent of flows. China, once a significant recipient, has fallen from the top rankings since 2006, whereas, India was the sixth largest recipient of ODA over the period from 2009-2011.Global poverty figures show that currently almost 870 million people in the world do not have enough to eat. The vast majority of hungry people that is around 98 percent live in developing countries, where almost 15 percent of the population is under-nourished[4]. Asia and the Pacific have the largest share of the world's hungry people that are around 563 million (World Food Program, 2013).

During the past 60 years, donors invested more than US$2.3 trillion in foreign aid but apart from this gigantic investment, 3 billion people still live on less than US$ 2 a day; 840 million are hungry; 10 million children die from preventable diseases; and 1 billion adults are illiterate. In poor countries about one quarter of children does not finish primary school education[5]. Regarding the impact of foreign aid, Herman Chinery-Hesse[6] says: "I don't know of any country in the world where a bunch of foreigners came and developed the country. I don't know one: Japan? Korea? No! No country did that. I know about countries that developed on trade and innovation and business." Bauer (1972) reported that all countries were once poor, and the rich countries did not become rich through foreign aid but by having the rule of law and the proper incentives**.** He added that all too often foreign aid simply turned out to be "transferring money from poor people in rich countries to rich people in poor countries".

It has been expounded by Rashid (2004) in his book "Rotting from the Head: Donors and Less Developed Countries (LDCs) Corruption". The general arguments may suggest tendencies toward donor misbehavior, but one needs specific examples to give force to claims of actual misbehavior. Rashid (2005) summarized that it is sadly ironic that the very poverty that induces aid to come to an LDC is an important reason why the aid can turn fruitless. The bureaucracy in the LDCs can be made porous and amenable to foreign directives; the press can be persuaded to avert its eyes; and the agents of civil society, such as the non-government organizations can be made to see that it is in their self-interest to acquiesce to such informal colonialism. Therefore, it is indispensable to understand whether the prime objective of foreign aid provision is to alleviate poverty, or it is provided as common international loan of arms, ammunition, military support, political support and other non-developmental affairs that merely serve to maintain relationship among donors and the recipient countries.

Desirable level of economic growth is imperative to improve social welfare. Pakistan economy is categorized a low middle income country. Like other developing countries, Pakistan's economy also face several administrative, economic, socio and political problems due to mismanagement, shortage of energy, low investment, inflation, terrorism, social unrest, unemployment and consequently sluggish economic growth. As the result of all these perpetuated problems per capita income levels are low and ultimately living standards undesirable at all. In this regard, the Government of Pakistan receiving foreign aid from other countries aimed to promote economic growth. The objectives of the policy makers are usually to fine tune economy persistently to minimize any economic disturbance, however.

This study seeks to verify whether or not foreign aid contributes to economic growth of Pakistan. The findings will certainly help in devising improved policies about foreign aid in the context of Pakistan economy. The main purpose of this study is to revisit the role played by foreign aid in the economic growth of Pakistan. Basically, this study intends to examine the impact of inflows of foreign aid on economic growth in Pakistan quantitatively using time series data covering the period from 1972-2012. Other sources of economic growth such as exports and workers remittances impacts on economic growth will also be considered in this study. The layout of the remaining study

is as follows. Section II discusses previous empirical studies in general and literature on foreign aid with reference to Pakistan in particular. Section III presents theoretical frameworks underpinning the research, data sources, methodology, and estimation and results. Finally, section IV summarizes the findings of the study.

1.1 History of foreign aid flows to Pakistan: Some historical facts

Almost all developing countries including Pakistan have been constantly involved in receiving foreign aid[7] in various forms i.e., grants and loans from developed countries with the prime objective to augment the process of national economic development. The foreign aid supporters believe that it is highly beneficial as it expedites the pace of economic growth through building infrastructure, mitigates balance of payment distortions, supports productive sectors such as manufacturing and bring new ideas, managerial skills and advanced technologies; encourages education, health, environment sectors and improves social welfare and is used to support subsistence consumption of food and helps to stabilize the economy(see Javid & Qayyum, 2011).Though, initially, the Government of Pakistan negated three times the American assistance to Pakistan in 1950s (Mohey-ud-Din, 2005). Eventually, Pakistan received first time Common Wealth Aid under the Colombo Plan during 1950's. During 1951-1952 (Pre Plan) total disbursed aid including project aid and non-project aid (i.e. non-food, food, balance of payment (BOP) and relief) to Pakistan was estimated at US$ 337 million. However, foreign aid increased drastically from 1979-1980 onward and the highest was recorded at US$ 4687 million in 2009-2010[8]. Inflow of foreign aid to Pakistan was recorded at US$ 1660 million in July-March 2011-2012.

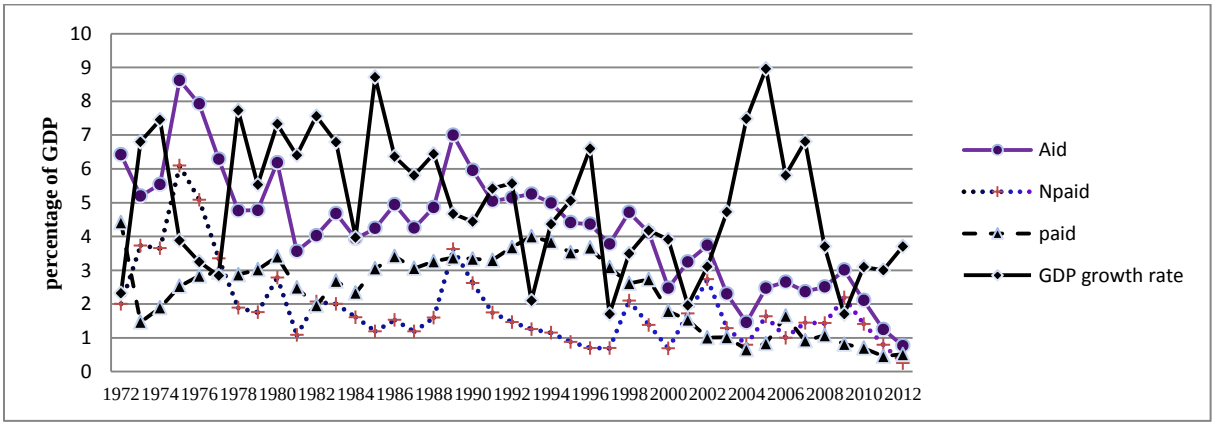
Not with standing, that inflows of American assistance to Pakistan has vacillated considerably over the last 60 years[9], with the emergence of 9/11event, aid to Pakistan increased considerably as both the Mr. Bush and Mr. Obama administrations characterized Pakistan as a vital US partner in efforts to combat terrorism and to promote stability in both Afghanistan and South Asia. Since 1950s, the US has pledged more than US$30 billion in direct aid, about half of it for military assistance (Epstein & Kronstadt, 2012). Recently in April 2013, the US Secretary of State, John Kerry requested 1.3 billion dollars that includes 860 million dollars as non-military assistance and about 300 million dollars as military assistance in 2014 to fund civil and military assistance along with supporting the existing diplomatic platform for Pakistan[10]. Pakistan is the third largest beneficiary of US aid after Afghanistan and Israel, and is also the third largest recipient of British aid after India and Ethiopia. British parliamentary committee in 2013 urged that rise in British aid to Pakistan should be conditional, that Pakistan's government should collect more taxcommendably[11]. Apparently, the government of Pakistan does not yet perform its due role for which it has taken the aid. Pakistan economy does not seem to grow economy like neighboring economies such as Bangladesh and India. It has also been observed that in Pakistan, the rich people become richer and poor become poorer continually.

If Pakistan does not really need foreign aid, then why do Western governments provide it? Foreign aid is generally driven by political interests and the desire to influence policies in the recipient countries by bankrolling the projects for the government (Javed, 2012). Perceptibly, the major motives of aid donors are not to boost efficiency and growth, rather, a primary motive is to promote the political, diplomatic, industrial and commercial interests of the country offering foreign assistance. In practice, foreign aid is doing minimal to eradicate poverty and to foster growth in the third world (Sadeq, 2002). However, Islam (1972) concluded that Pakistan received a significant amount of foreign economic assistance, which helped the country achieve a higher rate of savings and investment than would otherwise have been possible; whereas, at the same time consumption expenditures have also increased. In Pakistan, foreign aid was an important influence in strengthening the machinery and process of planning, in initiating the policy of import liberalization during 1963-1964 as well as in the relaxation of controls over food grain prices and distribution in the early sixties.

During 1951-2012, the donors' had provided foreign aid to Pakistan estimated at USD 88,325 million. Seemingly, Pakistan's statistics on economic and social indicators demonstrate that during 2011-2012, GDP per capita estimated at US$ 1,372, GDP growth rate almost 3.7 percent, inflation rate 13.8 percent, literacy rate around 57 percent[12], health expenditure 0.27[13] percent of GDP, total investment 12.5 percent of GDP, national savings rate 10.7 percent of GDP, fiscal deficit recorded at 5.0 percent, external debt and liabilities stock recorded at US$ 60.3 billion, unemployment rate around

6.0 percent and worker's remittances has been increased to US$ 10876.99 million (Economic Survey of Pakistan, 2011-12). Regarding poverty in Pakistan, every third Pakistani is living his life below the poverty line and therefore, around 58.7 million out of 180 million are living below the poverty line[14]. People living below the poverty line are 52, 33, 32 and 19% in Balochistan, Sindh, KPK and Punjab, respectively[15].

The UNDP's Human Development Report (2013) shows that living conditions of the average Pakistani remain unchanged and stands 146 out of 186 countries measured using the Human Development Index. The UNDP officials believe that the Pakistani policy makers need to focus on fundamental sectors such as health and education in order to move towards development. At the moment, Pakistan falls in the "low human development" category. Pakistan's expenditure on social sectors is lower than some of the poorest African countries such as the Democratic Republic of Congo, which spends 1.2 percent of GDP on health and 6.2 percent on education, versus Pakistan's 0.8[16] percent on health and 1.8 percent on education. Even Bangladesh, India and Sri Lanka also spend relatively higher amounts on both sectors than Pakistan. As per the HDI group ranking, Pakistan is the only country which has the lowest rank in four countries in the region, alongside, Bangladesh, Afghanistan and Nepal (UNDP, 2013). A comparison of trend analysis of foreign aid and its component as percentage of GDP along with economic growth can be read from Figure 1.



Source: Data gleaned from Economic Survey of Pakistan (various issues) Aid= foreign aid in aggregate as percentage of GDP, Npaid = non-project aid as percentage age of GDP, paid = project aid as percentage of GDP

***Figure 1**: GDP growth rate, total aid and non-project aid to Pakistan*

2. Literature review

Literature on foreign aid flows is extensive but it still remains to clearly demonstrate whether foreign aid flows encourage or discourage economic growth and development. Therefore, foreign aid has always been a controversial topic in terms of its impact on economic growth of the recipient countries and the debate is still going on. Quibria (2010) reported that though literature on aid effectiveness is extensive but controversial and copious empirical literature produced more confusions than robust conclusions. The study concluded that assessments of the donors and the recipient suggest that Bangladesh achieved mixed results in aid effectiveness, although the country's performance in utilizing aid seemed to have improved significantly in recent years. The mixed result of Bangladesh can be traced to shared failures on the part of the government and the donors.

Several studies have showed that foreign aid has positive effect on economic growth[18]. For instance, in a cross-country regression analysis of thirty four countries in the 1950s and fifty one countries in the1960s, treating foreign aid, foreign investment and domestic savings as explanatory variables, Papanek (1973) found that foreign aid had a substantially greater effect on growth than the other variables. He further added that aid, unlike domestic savings, can fill the foreign exchange gap as well as the savings gap. Dowling and Hiemenz (1983) examined the aid-growth relationship for the 13 countries from Asian region, used pooled data and found a positive and significant impact of aid on

growth. For Sub-Saharan Africa, Levy (1988) reported a significant positive relationship in a regression model between aid and incomes per capita during 1968-1982.

After using panel data from 1970-1993 pertaining to 56 developing countries, Burnside and Dollar (2000) found that aid has a positive impact on growth with good fiscal, monetary, and trade policies. However, in the presence of poor policies aid has no positive effect on growth. Other studies, such as Durbarry *et al.* (1998) and Alvi *et al.* (2008) have also supported Burnside and Dollar (2000) findings that foreign aid has positive effect on economic growth but conditional to sound economic policies, good governance, strong institution, and favourable geography. In contrast to Burnside and Dollar and their followers, it is also argued that in the presence of good governance and sound policies, economies will certainly grow and will reduce poverty, whether they receive foreign aid or not. Those countries which have good policies and governance will never get foreign aid.

In a study of 77developing countries over a whole period from 1971-1990 and two sub-periods from 1971-1980 and 1981-1990, Fayissa and El-Kaissy (1999) found that foreign aid positively affects economic growth. Similar, empirical results of the study conducted by Gounder (2001) supported that total aid flows and its various forms, i.e. bilateral aid, grant aid and technical cooperation grant aid have significant positive impacts on economic growth during 1968-1996. Hatemi and Irandoust (2005) used panel of developing countries: Botswana, Ethiopia, India, Kenya, Sri-Lanka, and Tanzania over the period from 1974-1996. The long-run elasticities (close to one for most countries) show that foreign aid has a positive and significant effect on economic activity for each country in the sample. Al-Khalid (2008) found that foreign capital flow has a direct impact on the economic development of Jordan during 1990-2005.

However, Al-Khaldi (2008) results on the impact of ODA on growth are insignificant, while only loan aid has a positive impact on growth. Asteriou (2009) supported the theoretical hypothesis of a positive relationship between aid and GDP growth after using a panel data set from 1975-2002comprising of five South Asian economies: Bangladesh, India, Nepal, Pakistan and Sri Lanka. Arndt *et al.* (2010) findings indicated that aid has a positive and significant causal effect on growth over the long run. Kargbo (2012) found that foreign aid significantly contributes to economic growth in Sierra Leone during 1970-2007. Mustafa and Razak (2012) used panel data over the period from 1987-2011 and simultaneous equation model in set of 14 African Muslim Countries (AMCs). The finding claims that the development assistance of Islamic Development Bank has positive impact on the economic growth of AMCs through investment as the major transmission mechanism. However, Mustafa and Razak (2012) study has followed the two major transmission mechanisms that are investment and human capital for economic growth of AMCs. Though, the study claimed that foreign aid through investment has a positive impact on economic growth, yet, the impact on economic growth through human capital transmission mechanism seems negative. Ali (2013) found a negative and significant impact of foreign aid on economic growth in the long and short run during 1970-2010 in Egypt, by using Johansen Cointegration test and Vector Error Correction Model.

2.1 Previous empirical evidences from Pakistan

Numerous studies have been carried out on the role of foreign aid flows on Pakistan economy but the results are mixed[19].To this date, there are a few noteworthy empirical studies on the effectiveness of foreign aid in Pakistan which favored the contribution for foreign aid and proved quantitatively that there is a positive impact of foreign assistance on economic growth. For example, Shabbir and Mahmood (1992) found that disbursements of grants and external loans have a positive impact on the rate of growth of real GNP during 1959-60 to 1987-88. Mohey-ud-Din (2005) claims that inflow of foreign aid into Pakistan is a major form of the foreign capital inflow and have a significant role for the country's economic development. He empirically confirmed the positive relationship between ODA and GDP during1960-2002. Further, the study added that the overall impact of the aid on the economic development of Pakistan is positive. Hye *et al.* (2010) findings during 1975-2007 revealed that ODA and aid has positive impact on economic growth only in the long run and suggested that Pakistan needs to focus on the ODA in the long run for the sake of economic growth.

Ellahi and Ahmad (2011) used data over the period 1975-2010 and found that in short run foreign aid has positive effect. On the contrary a negative and significant effect of foreign aid in long run is observed. However, the study overall claimed that robust and direct positive impact of foreign

aid on economic performance indicators prevail. Chowdhury and Das (2011) used data for the period from 1976 -2008 and found that foreign aid has a positive and significant impact on real GDP per capita growth in Bangladesh, Nepal, Pakistan and Sri Lanka[20]. Javid and Qayyum (2011) used data for the period 1960-2008 and employed Autoregressive Distributed Lag (ARDL) approach. The study found that foreign aid and real GDP have a negative relationship; however, it has concluded that the results strongly supported that foreign aid does have a positive impact on economic growth in Pakistan, though conditionally so, if based on sound macroeconomic policies.

In a similar vein, the negative impact of foreign aid on economic growth of Pakistan has also been tested empirically by some economists. For example, Aslam (1987) through utilizing the multiple regression analysis, where the results indicated that net aggregate foreign capital has a negative effect on domestic savings and an insignificant effect on investment in Pakistan 1963-64 to 1984-85. Khan *et al.* (1992) revealed in the empirical study that foreign capital inflows have a negative impact on savings in Pakistan during 1959-60 to 1987-88, and a one percent increase in the foreign capital inflows discourages saving by 0.21 percent. The negative impact of foreign capital inflows suggested that the most part of external assistance has been used for consumption purposes and it has dampened savings efforts by both the private and public sectors in the country. Besides, from foreign capital inflows, foreign aid and its components like project and non-project aid failed to show any positive and statistically significant impacts on the national saving rate in Pakistan. Dhakal *et al.* (1996) failed to find any strong relationship between aid and economic growth in India, Nepal and Pakistan. Khan and Ahmed (2007) through empirical investigation proved negative but insignificant effects of foreign aid on the growth using data during 1972-2006. The results further showed that domestic investment, export growth, and FDI flow are important contributors in enhancing economic growth in Pakistan. A brief summary of the empirical studies on the impact of foreign aid on economic growth of Pakistan are reported in Table 1.

Clearly results of the available empirical literature regarding the relationship between foreign aid and economic growth on Pakistan are inconsistent. The current research hypothesized that foreign aid is expected to be negatively while workers remittances and exports are positively related to economic growth of Pakistan for the period under the study. The study uses an econometric model for testing as to whether or not foreign aid is positively related to economic growth in Pakistan during the period from 1972 to 2012.This study utilizes more holistic approach such as using ECM for empirical investigation after checking for unit root test which has not been used by much prior studies. Time period is relatively long and includes latest data. This study also includes other explanatory variables such as exports (trade) and workers remittances.

***Table 1**- Empirical studies on the impact of foreign aid on economic growth of Pakistan*

Author (s)	Sample periods	Methodology	Dependent variable(s)	Independent variables	Coefficient (t-ratio)	Findings
Chowdhury and Das (2011)[1,2]	1976-2008	Co-Integration procedure	Real GDP per capita,	Foreign aid, gross capital formation and trade openness	+0.002 (1.06)	Found positive impact of foreign aid on economic growth
Ellahi and Ahmad (2011)[1]	1975-2010	ARDL	Real GDP	FDI, ODA, share of investment and labor force	+0.15*	Found positive impact of ODA on economic growth
Hye *et al.* (2010)	1975-2007	ARDL	GDP	FDI, human resource development, inflation and ODA and aid	+0.081 (2.39)	Found positive impact of ODA and aid (two period lags) on economic growth
Khan and Ahmed (2007)[1]	1972-2006	ARDL	Real GDP	Domestic investment, project aid, non-project aid, FDI, labour force, real value of exports.	-0.002 (1.71) +0.008 (1.68) -0.005 (2.12)	• Significant negative effect of aggregate aid on growth • Insignificant positive effect of project aid on growth[4] • Significant negative effect of non-project aid on growth
Mohey-ud-Din, (2005)	1960-2002	OLS	GDP	ODA	+ 64.4(3.48)	Found positive impact of ODA on GDP.

** Significant at 10% level; Five South Asian countries: Bangladesh, India, Nepal, Pakistan, and Sri Lanka. All variables are expressed in natural logarithmic term and as a percentage of GDP. In long run found significant positive impact of project aid on economic growth the coefficient size (t-ratio) is + 0.02 (1.78).*

3. The theoretical framework

The term foreign assistance or what was once called aid got its coverage after Marshall Plan[21] in Europe during 1950s after World War II for curtailing economic disturbance in Europe. The significance of foreign aid is, thus, rooted in modernization theory and according to this theory the "underdeveloped" economies of the world are traditional societies. Historically, once all societies were "traditional" but later on all these traditional societies got modern and socially developed through the adoption of innovation and technological growth within the capitalist system. This theory believes that capitalism motivates the individual to constantly strive toward improving its product. Therefore, history tells that foreign aid is colonial[22]and its granting began with empires investing in their colonial outposts so as to develop, among other social elements, transportation and domestic economy.

No substantial empirical literature exists on the connection between foreign aid and economic growth due to the lack of solid theoretical model by which foreign aid would affect growth, and which could pin down the empirical specification of the aid-growth relationship (Easterly, 2010). However, the relationship between foreign aid and economic growth is based on the two gap model. Generally, there are many problems in developing countries where domestic resources are scarce including paucity of physical as well as human capital. According to Chenery and Strout (1966) as per the two-gap model that despite having surplus labour, developing countries are constrained by lack of domestic savings and foreign exchange availability for investment. According to this theory, developing countries remain underdeveloped due to savings and foreign exchange constraints. The low level of capital formation due to low level of domestic investment is because of insufficient level of savings. Investment provides many benefits as it generates jobs opportunities and increase living standards and thereby enhancing the overall economic growth. Due to inadequate earnings of foreign exchange, import-export compels poor countries to import capital goods and advanced technology from developed countries. Developing countries also face fiscal deficit constraints due to which their respective governments need additional revenues to finance public investments in education, health, infrastructure, and other important economic and social sectors for development (Bacha, 1990; Taylor, 1990). Meanwhile, with reference to the philosophy of two gap theory, the importance foreign aid becomes evident as it provides additional funds that will supplement those gaps and will certainly augment the process of economic growth and development in developing countries.

About the two gap model, Easterly (2010) reported that in this model, the first gap is between the amount of investment necessary to attain a certain rate of growth and the available domestic saving between investment and saving, while the second gap is the one between imports requirements for a given level of production and foreign exchange earnings. At any moment in time, one gap is binding and foreign aid fills that gap. While, the developing countries cannot overcome the deficiency of savings and foreign exchange earnings from their own resources, therefore, foreign aid encourages growth in developing countries by reducing the savings-investment and export- import gaps. He further explained that the model in which aid fills a financing gap and allows greater investment that aid will actually finance investment rather than consumption. The "financing gap" model in which aid increases investment and then that investment increases economic growth has dubious theoretical foundations and numerous empirical failings. Yet, no other model of aid and growth has arisen to take its place. The financing gap model continues to be used today in the World Bank and other institutions making aid policy.

3.1 Model specification

The following simple linear model is used in the present study to investigate the impact of foreign aid, exports and workers' remittances on economic growth in the context of Pakistan. Equation 3.1 through 3.4 specifies the model used in this study. Equation 1is expressed as follows:

$$lnY_t = \gamma_{0+}\gamma_1 lnAID_t + \gamma_2 lnX_t + \gamma_3 lnWR_t + \mu_t \qquad (3.1)$$

where, Y= real GDP per capita, AID = total foreign aid in aggregate which includes project aid and non-project aid, where non-project aid consists of non-food aid, food aid, balance of payment and relief, X= real exports value, WR=workers' remittances, and μ_t,= error term.The subscript (t) indexes time. It is assumed that the μ is to be independently and identically distributed (μ_t ~iid (0, σ2). Data are converted into natural logs. Variables are converted into natural logs because of two main reasons; first, the coefficient of the cointegrating vector can be interpreted as long term elascticities if

the variables are in logs, second, if the variables are in logs, the first difference can be interpreted as growth rates. Similarly, if the variables are in logs, it helps to overcome on non-linearity problem and therefore, by this practice all variables will come in to the same unit which certainly helps in robust empirical examination.

Specifically, using time series data, it is important to check the time series property of variables by using unit root test, before, constructing the system model. This test shows whether or not variables are stationary. In order to check the unit root of variables, we used the Augmented Dickey Fuller (ADF) test which can be written in general form as follows:

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{t=1}^{n} \alpha \Delta Y_i + \mu_t \quad (3.2)$$

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{t=1}^{n} \alpha \Delta Y_i + \delta_t + \mu_t \quad (3.3)$$

where, Δ is the first difference operator, Y_t is the relevant time series, α_0 is a constant, n is the optimum number of lags in the response variable. The μ_t is a random residual term that follows the classical assumptions. The null hypotheses is that is that the variables under estimation have unit root against the alternative hypotheses is that it does not. Aikaike Information Criteria (AIC) has been used to select the optimal lag length. Equation (3.2) includes merely drift, whereas, equation (3.3) includes both drift and linear time trend.

After having checked all included time series variables for unit root, the next step is to test cointegrating among time series (i.e. AID, exports and workers remittances). The cointegrating test shows whether a group of non-stationary series is co-integrated or not. To manage the problem of spurious correlation and misleading inference, the co-integrating relationship among variables was studied following the procedure presented by Johansen and Juselius (1990).

According to Engle and Granger (1987), if there is co-integration relationship among non-stationary variables, there has to be an error correction representation, which demonstrates the dynamic convergence of the system to the long run equilibrium. It is an important condition that for co-integration all the variables must be integrated in the same order. If this condition is satisfied, the residuals from the long run estimates can be used as an Error Correction Term (ECT) in order to explain the short run dynamic. In a short run dynamic, the error correction variable shows the proportion of the disequilibrium from one period that is corrected in the next period. The following Error Correction Model (ECM) is used for short run adjustments:

$$\Delta lnY_t = \gamma_0 + \gamma_1 \Delta lnAID_t + \gamma_2 \Delta lnX_t + \gamma_3 \Delta lnWR_t + ECT_{t-1} + \mu_t \quad (3.4)$$

where, Δ shows the first difference of the variables and ECT_{t-1} is the time lag error correction term or equilibrium error term of one period lag[23].

This study is based on secondary time series data covering the time period from 1972 to 2012. Data on real GDP per capita, total foreign aid in aggregate, non-project aid, real exports value and workers' remittances are gleaned from Economic Survey of Pakistan (various issues) and World Development Indicator (2013). Dataused for empirical estimation on these variables are in PKR million (local currency).

4. Estimations, results and discussion

Empirical work based on time series data assumes that the underlying time series is stationary. Any estimation based on non-stationary variables may lead to spurious results which are not acceptable even with the high R-squared value. Therefore, time series property of each variable is investigated using the ADF test for the unit root. The test is conducted with deterministic trend and without a deterministic trend for each of the series. The test confirmed the calculated ADF statistics at 1 percent and 5 percent significance levels with their respective critical values, and on the basis of ADF results. It was found that the variables were not stationary at level (I(0)), therefore, all included variables were differenced once in order to verify their stationarity. After first differencing, the calculated ADF test statistics rejects the null hypothesis of unit root at 1 percent and 5 percent

significance levels when compared with their respective critical values. The ADF test shows stationarity of each variable at first differencing under constant, and constant and trend levels, and shows the same order of integration that is I(1). The results are reported in Table 2.

Table 2 *- ADF unit root tests for stationarity with trend*

Variables	***I*(0)**	***I*(1)**	***I*(d)**
lnY	-2.584(0)	-4.291(0)	*I*(1)
lnWR	-2.593(0)	-4.173(0)	*I*(1)
lnAID	-2.404(0)	-6.113(0)	*I*(1)
lnX	-2.331(0)	-7.619(0)	*I*(1)
lnNPAID	-1.798(0)	-9.238(0)	*I*(1)

Note: Figures in () indicate the lag length based on Schwarz Information Criteria (SIC), maxlag=0.Whereas, I(d) refer to the level of integration. The MacKinnon (1996) critical values for constant are -3.605593 and -2.936942, and for constant & trend are -4.205004 and -3.526609 at 1 percent and 5 percent levels of significance respectively. Lag length based on Schwarz Information Criteria (SIC), maxlag=0 NPAID denotes non-project aid

Summary of the detail of regression estimates of the Johansen co-integration test and ECM on the effects of foreign aid along with the other variables such as exports and workers remittances on economic growth are presented in Table 3 and Table 4, columns 1-4 respectively. Moreover, for further investigation the ECM has been used. Hence, the ECM provides useful information about the speed of adjustment in response to a deviation from the long run equilibrium which is worthwhile in policy formulation. At first, only foreign aid in aggregate was introduced in the regression model; afterwards the impact of non-project aid and project aid on economic growth was estimated individually. The results show the negative impacts of foreign aid in aggregate and non-project aid on response variable (see Table 4, columns 1-4).

Table 3 *- Johansen co-integration test*

H_0	Eigen-value	$\lambda_{Max-Eign}$	Critical Value (5 % level)	λ_{Trace}	Critical Value (5 % level)
r=0	0.748469*	48.30665	27.58434	87.90975	47.85613
r≤1	0.558544*	28.61870	21.13162	39.60309	29.79707
r≤2	0.247560	9.955212	14.26460	10.98440	15.49471
r≤3	0.028977	1.029186	3.841466	1.029186	3.841466

Note. * denotes rejection of the hypothesis at the 0.05 level. r indicates the number of cointegration vectors under null hypothesis (H_0). Trend assumption: linear deterministic trend.

Table 4*-Regression estimates of the effects of foreign aid on economic growth of Pakistan*

Independent Variables	**1**	**2**	**3**	**4**
Intercept	0.114 (1.853)	0.103 (1.645)	-0.041 (1.195)	-0.040 (1.142)
ΔlnAID	-0.316 (-1.456)		-0.259[b] (-2.497)	
ΔlnNPAID		-0.183 (-1.456)		-0.147[b] (-2.753)
ΔlnWR			0.128 (1.085)	0.141 (1.128)
ΔlnX			0.974[a] (15.061)	0.882[a] (13.193)
ECT(-1)	-0.358[a] (-3.90)	-0.223[b] (-2.60)	-0.932[a] (-6.229)	-0.695[a] (-5.205)
R^2-squared	0.343	0.258	0.881	0.868
Adj. R^2	0.301	0.218	0.867	0.853
S.E. of reg.	0.371	0.388	0.160	0.168
F-statistic	9.244[a]	6.443[a]	64.84[a]	57.94[a]

Independent Variables	1	2	3	4
Diagnostic Tests (for column 6, the rest of columns having almost the similar results): CUSUM= 5% significance, Breusch-Godfrey Serial Correlation LM Test (p-value)= 23.106(0.082), Jarque-Bera (p-value)=4.656(0.95), ARCH Test (p-value)=0.689(0.406)				

Note: a significance p ≤ 0.01 and b significance p ≤ 0.05Absolute values of t-ratio are in parentheses.

Table 4 columns 1-2 show that foreign aids in aggregate and non-project aid have negative impacts on economic growth, though statistically insignificant. After estimating the individual impact of foreign aid in aggregate and non-project aid on economic growth, two more equations were estimated (see Table 4, columns 3-4). According to the hypotheses of the present study, the coefficient size of foreign aid variable in aggregate and its decomposed component are expected to be negative, whereas the coefficient of exports and workers' remittances variables are expected to be positive. The signs of all coefficients are consistent with the hypothesized signs. The F- values for all equations given in Table 4, columns 1-4 reveal that the regressions are statistically significant, suggesting that all explanatory variables jointly influence the response variable.

It is evident from column 3 of Table 4, that the adjusted R^2 explains 86 percent variation in the response variable (economic growth) by the explanatory variables (foreign aid in aggregate, exports and workers remittances). Results show that the residual one period lag (ECT_{t-1}) has a negative sign and statistically significant at 1 percent level, suggesting the validity of long run relationship among variables in the model. The estimated coefficient of ECT is -0.932, meaning that the system rectifies its previous period disequilibrium at a speed of 93.2 percent per annum. The effect of AID is statistically significant at 5 percent level. The estimated coefficient of foreign aid in aggregate is -0.259 which suggests adverse effect of 25.9 percent on economic growth during the study period. This coefficient is statistically significant at 5 percent level. The effect of exports (X) is as expected, and statistically significant at 1 percent level of significance. However, workers remittances (WR) though shows positive effect on economic growth as expected but it is statistically insignificant.

Similarly, the results given in Table 4 column 4 reveal that the adjusted R^2explains85 percent variation in the response variable. The ECT term is found statistically significant at 1 percent level with a negative sign. The estimated coefficient of ECT is -0.695, implying that the system rectifies its previous period disequilibrium at a speed of 69.5 percent per annum. In order to verify empirically, that whether non-project aid (NPAID) has effect on economic growth or otherwise. Therefore, non-project variable has been included in the model, where, the effect of non-project aid is statistically significant at the 5 percent level. The estimated coefficient of non-project aid is -0.147 which indicates negative effect of 14.7 percent on economic growth. This suggests that non-project component of foreign aid does not efficiently contribute to economic growth, rather distorts it.

This study finding reveals that foreign aid plays no positive role; rather it negatively affects economic growth. It is also shown by Boone (1996) that aid does not accelerate economic development. Though, findings of Khan and Ahmed (2007) are the most pertinent to this study but they failed to obtain any significant results. The present study empirically confirms that the effect of foreign aid on economic growth is negative and statistically significant for the period under the study in Pakistan. The empirical evidence reveals that foreign aid in aggregate and its decomposed component non-project aid adversely affected economic growth in Pakistan whereas exports had a significantly positive contribution.

The finding that foreign aid negatively impact economic growth is in accord with findings by Javed and Ahmed, (2001), Khan and Ahmed, (2007) but at variance with findings by Mohey-ud-Din, (2005),Chowdhury and Das, (2011), and Ellahi and Ahmad (2011) with reference to Pakistan. The robustness of the regression models has been tested by using appropriate diagnostic tests such as R^2, adjusted R^2 criteria, Breusch-Godfrey Serial Correlation LM test, Jerque-Bera normality test and CUSUM test. All these tests reveal that the models fit the data well and the residuals of the model are not serially correlated and are normally distributed as desirable. Thus, the empirical results obtained during the study period are cogent, meaningful and acceptable for onward policy considerations.

It is, however, pertinent to know about the effectiveness of aid. It is also imperative to find answers to intriguing questions like how many countries in the world got development on the basis of

foreign aid. If not why many donors lavishly provide foreign aid on one hand and developing countries welcome foreign aid on the other? Seemingly, history tells us that no single country achieved growth and development due to foreign aid. For example, the stories of Asian Dragons: Hong Kong, South Korea, Singapore and Taiwan, all grew on domestic efforts and right policies such as open trade policy, not on foreign aid.

Though, it is argued that foreign aid contributes to economic growth and brings prosperity, yet, in reality, aid has failed despondently and is nothing except wastage of money. For them, aid for development means, not to utilize indigenous efforts but depends on outside efforts, this kind of development can be termed as 'rented development' which is not sustainable and relies only on the mercy of donors. Foreign aid makes countries dependent and deviate them from self-sufficiency, consequently, these countries will remain underdeveloped.

Presumably, Pakistan receives continuous foreign aid but results in no fruitful outcomes as evident in terms of poverty reduction and economic growth and development. It has also been reported by Anwar and Michaelowa (2006) that around US$73.14 billion foreign aid was received by Pakistan from 1960-2002[17]. But in term of benefits for the entire society, foreign aid has failed to improve the economic conditions in Pakistan. No doubt, in the whole period of around 66 years of existence of Pakistan, only a few Mega projects such as Terbala and Mangla dams, Pakistan Steel Mills and Motor ways are said to be the visible steps taken towards economic development of Pakistan. Despite of these facts, still, our politician and policy makers are in favour of and insist to expand the volume of foreign aid.

As the economic and social indicators of Pakistan reveal that instead of encouraging economic development, still Pakistan economy gives a gloomy picture. Unfortunately, in almost all developing countries usually governments are long on a series of promises and in practical short on committed actions. Therefore, in the same way every successive government of Pakistan claims high and shows green garden but sadly do nothing practically, for the betterment of the country as desirable. Hence, the government of Pakistan must define the logic and strategy of how Pakistan will get out of foreign aid, yet sixty years gone since inception. Otherwise the future generation is going to be laden.

Conclusions

This study investigated the contribution of foreign aid to the economic growth of Pakistan. Based on the error correction model for the period 1972 through 2012, empirical analysis demonstrates that foreign aid and its decomposed component (non-project aid) have significantly negative effects on real GDP per capita, whereas results pertaining to the effects of exports on economic growth are significantly positive. The analysis also demonstrates that inappropriate utilization of foreign aid erodes overall macroeconomic incentives in Pakistan; most of the foreign aid goes to non-developmental heads and is largely consumed. Thus we can argue that foreign aid deters economic growth whereas exports earnings have positive impacts.

The policy implications of these findings are that management authorities need not rely on foreign aid because it does not seem to be an appropriate channel through which the country can attain desirable level of economic growth and development but concentrate upon indigenous resources. The volume of exports needs to be enlarged in order to strengthen trade which is a relatively good option for economic development of Pakistan. Appropriate mechanism needs to be adopted for export led growth strategy in order to bolster economic growth. The Government of Pakistan needs to invest in the energy sector, roads, and telecommunication because such kind of physical infrastructure will strengthen the volume of exports. Foreign remittances should also be enhanced. Lastly, the government should only accept non-refundable/repayable foreign assistance in the form of grants and restrain from foreign aid with hard conditions to sustain economic growth and development.

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Notes

1. As per the World Bank classification, based on the Gross National Income (GNI) per capita, lower middle income countries ranged from US$ 1026 to US$ 4035. Pakistan's per capita GDP was estimated US$ 1372 in 2011-2012.
2. It has also documented that aid importance has received political interest during 21stcentury, particularly with the introduction of Millennium Summit of 2000 that is Millennium Development signed by 189 countries. Millennium Development Goals summarized the eradication of extreme poverty, providing primary education, promotion of gender inequality and empowerment of women; reduction of child mortality; improvement of maternal health; combating HIV/AIDS, malaria, and other diseases; ensuring environmental sustainability and global partnership for development (see also Veiderpass & Andersson, 2007).
3. ODA comprises of 23 countries that are members of the OECD Development Assistance Committee and the European Union (EU). The U.S. is consistently the largest donor by volume, with ODA levels averaging almost US$ 30 billion a year over the period from 2009-2011. Four other counties like Germany, the United Kingdom, France and Japan have averaged more than US$ 10 billion a year over 2009-2011. These five countries are consistently the largest donors by volume and combined account for just under two-thirds of total ODA (Coppard *et al.*, 2013).
4. The World Bank (2008) estimated 1,345 million poor people in developing countries who live on US$ 1.25 a day or less.
5. See (Easterly, 2006; Griffiths & Tan, 2007). William Easterly was formerly a World Bank economist.
6. Available fromhttp://www.povertycure.org/issues/foreign-aid/
7. Classification of foreign capital flows to Pakistan has well documented by Hussain (2005).
8. See for detail (Islam, 1972; Khan & Ahmed, 2007; Economic Survey of Pakistan, various issues).
9. Though, U.S has been providing aid to Pakistan but with harsh conditionalities such as (i) cooperating with the U. S. in counter terrorist efforts against Haqqani Network, the Quetta Shura Taliban, Lashkar-e-Taiba, Jaish-e-Mohammed, Al Qaeda, and other domestic and foreign terrorist organizations, including taking steps to end support for them and preventing them from basing and operating in Pakistan and carrying out cross border attacks into neighboring countries, (ii) not supporting terrorist activities against U.S. or coalition forces in Afghanistan, and Pakistan military and intelligence agencies are not intervening extra-judicially into political and judicial processes in Pakistan, (iii) dismantling improvised explosive devices (IED) networks and interdicting precursor chemicals used to manufacture IEDs, (iv) preventing the proliferation of nuclear-related material and expertise, (v) issuing visas in a timely manner for U.S. visitors engaged in counterterrorism efforts and assistance programs in Pakistan, and (vi) providing humanitarian organizations access to detainees, internally displaced persons, and other Pakistani civilians affected by the conflict.
10. Retrieved from http://www.ndtv.com/article/world/us-assistance-to-pakistan-helps-reduce-terrorism-john-kerry-352667
11. Mr. Malcolm Bruce, Chairman, International Development Committee added that we cannot expect people in the UK to pay taxes to improve education and health in Pakistan if the Pakistani elite does not pay meaningful amounts of income tax. See the Ary News, April 4, 2013. Retrieved from http://www.arynews.tv/english/newsdetail.asp?nid=71863
12. Those people who can only read and write their names only are also included.
13. It was 0.23 in 2010-11 and in the past more than one decade it was recorded at average above 0.57 (Economic Survey of Pakistan, 2011-12)
14. According to the UNDP, HDI (2013) report 49 percent of Pakistan's population lives in poverty
15. See (Khuwaja, 2012). Whereas, Balochistan, Sindh, KPK and Punjab are the four provinces of Pakistan.
16. Where, Economic Survey of Pakistan, 2011-12 indicates health expenditures 0.27 percent of GDP.
17. While, foreign aid received US$ 81.097 billion during 1972-2012.
18. While, Mosley (1980) has also observed a positive relationship between foreign aid and economic growth for UK aided countries and negative for French and Scandinavian aided countries. However, he concluded that aid could not improve the economic conditions in Bangladesh, India and countries like Korea, Malawi and Kenya.
19. Khan and Ahmed (2007) disclosed that the significance of foreign aid in economic growth is a debatable issue and remains unsettled at both theoretical and empirical levels. Though, Pakistan constantly receiving foreign aid since its inception in 1947 but yet intended outcomes has not been achieved as desired for its socio-economic development.
20. However, aid does not have any significant impact on growth of real GDP per capita only in case of India.
21. Marshall Plan was basically the European Recovery Program. In Europe after the end of World War II there was great political instability and widespread personal suffering and the economy was in wrecked. On June 5,

1947, in an address at Harvard University, Secretary of State, G. C. Marshall presented the idea of a European self-help program to be financed by the United States. He strongly believed that it was in the best interest of the United States to help Europe rebuild and to achieve economic stability in the region. However, Aid provided by the Marshall Plan officially ended on Dec. 31, 1951 (Encyclopedia Britannica).

22. Alesina and Dollar (1998) found substantial evidence that the direction of foreign aid is dictated by political and strategic consideration, enough by the economic needs and policy performance of the recipient countries. The study further added that colonial past and political alliance are the major determinants of foreign aid.
23. An error correction model requires all non-stationary variables to be first-differenced, to produce stationary variables. Some features of the error correction term are (a) the error correction mechanism term represent the speed of adjustment back to the long run relationship among the variables or with which the model returns to equilibrium following an exogenous shock, (b) the error correction value must be in negative, if negative it means that the model is stable, indicating a move back towards equilibrium , a positive sign suggests movement away from equilibrium, (c) the coefficient size should be in between 0 and 1, where 0 indicating no adjustment one time period later, and 1 suggest full adjustment, and (d) the error correction term can be either the difference between the dependent and explanatory variable (lagged once) or the error term (lagged once), they are in effect the same thing.

IS DISCRETIONARY FISCAL POLICY EFFECTIVE? THE CARIBBEAN EXPERIENCE

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Abstract

Governments' recourse to fiscal policy to mitigate the effects of the 2008-2009 global economic crisis renewed interest on the role of fiscal policy on influencing economic activity. Consequently, vast empirical research emerged in developed countries, while little remains known in developing economies which implemented similar fiscal stimulus packages. Accordingly, this paper analyzes the economic growth effects of discretionary fiscal policy in small open developing economies with application to the Caribbean. Using structural vector autoregressive methods, results reveal new evidence of expansionary fiscal contractions in Barbados. Government expansionary policies transitorily stimulate Trinidad and Tobago's economy but have no effect on Jamaica's.

Keywords: fiscal policy shocks, structural VAR, impulse response functions, small island developing states, Caribbean

JEL Classification: E62, C32

1. Introduction

The 2008-2009 "Great Recession" wreaked havoc across the world. In response, most governments resorted to using fiscal policy in an effort to mitigate its effects. Such prevalence of fiscal policy interventions reflect revealed optimism regarding the potential effectiveness of activist fiscal policy (Auerbach *et al.*, 2010). Yet economic theory is not conclusive on whether discretionary fiscal policy (increases in government spending and/or decreases in tax revenue) is effective. The classical models argue that the market system automatically adjusts to booms and busts. Therefore, they presume no role for fiscal policy indicating its ineffectiveness. The neoclassical models and neo-Keynesian models, on the other hand, imply positive effect of government spending on output; albeit with different dynamics. The neoclassical models (see for example Baxter and King, 1993) typically predict a negative effect on private consumption, while neo-Keynesian models predict the opposite sign.

The empirical literature also offers no consensus on the size of the effects of fiscal shocks on output. The evidence is largely based on two approaches: the "dummy variable" approach and the "structural vector autoregressive" (SVAR) models. Studies on the dummy variable approach typically report negative private consumption and positive output response to government spending; see for example Ramey and Shapiro (1998). The approach relies on the narrative record and news about fiscal build-ups to identify shocks to government spending. Although the approach identifies shocks postulated as truly exogenous to the system, it is subject to the researcher's ability to accurately identify the dates such exogenous shocks occurred. Thus, several studies (for example Ilzetzki *et al.*, 2013; Bénétrix and Lane 2013; 2010; Beetsma *et al.*, 2010) use the SVAR approach pioneered by Blanchard and Perotti (2002). It involves identifying fiscal policy "shocks" using SVARs and simulating the dynamic impact of these shocks on GDP and other variables of interest. The SVAR studies typically find a larger effect of government spending on GDP and in some cases crowding-in of consumption (e.g. Blanchard and Perotti, 2002, and Galí *et al.*, 2007). Other SVAR studies find crowding-out of consumption and a smaller but positive effect on GDP (see Perotti, 2007). Mountford and Uhlig (2009) use less restrictive sign-restrictions to identify fiscal shocks and find much smaller deficit-spending multipliers.

The extant research is enormous in developed countries yet there is dearth of research in developing countries. This paper attempts to fill this gap in order to shed light on the relative merits of alternative modeling approaches as well as provide wider empirical evidence. Through extending the aforementioned literature, we investigate the output and debt effects of discretionary fiscal shocks – changes in government spending and taxes – on small island developing states. The small island developing economies of Caribbean countries provide a natural experiment on analyzing the

discretionary fiscal policy effects given the region's adverse effects from the global economic crisis. The Caribbean output contracted by 2.8% compared to the global average of 0.6% in 2009 (IMF, 2010). Across the region, however, there were diverse effects on output. Barbados' output fell by 0.2% in 2008 and slumped by a further 4.4% in 2009. Jamaica recorded economic downturns of 0.9% and 2.7% in 2008 and 2009 respectively. Trinidad and Tobago's economic growth decelerated in 2008 and declined by 3.2% in 2009. Similar to OECD countries, the small island developing economies in the Caribbean responded by injecting large discretionary fiscal stimulus packages in 2009 to dampen recessionary pressures and stimulate their economies. While Jamaica's fiscal expansion focused on both expanding government spending and tax cuts, Barbados and Trinidad and Tobago responded through increasing government expenditure.

The study focuses on three largest Anglo-Caribbean countries by GDP size – Trinidad and Tobago, Jamaica and Barbados. Barbados operates a fixed exchange rate system for about 40 years. Trinidad and Tobago has a crawling peg (quasi-fixed exchange regime) while Jamaica operates a flexible exchange rate since 1991. All three countries are open economies, though Jamaica and Barbados are more indebted than Trinidad and Tobago. As of 2009, Jamaica's central government debt to GDP ratio stood at 113%, Barbados at 92% and Trinidad and Tobago at 21%.

Using structural vector autoregressive approach (VAR) over the period 1971-2012, while controlling for the debt burden – a major challenge in the region (see e.g. Greenidge *et al.*, 2010) – our results show that expansionary government spending has a transitory positive impact on GDP in Trinidad and Tobago due to availability of fiscal space. In the case of Jamaica government spending is not effective in jump-starting the economy. In Barbados we find new evidence of contractionary fiscal expansions. This is a novelty in empirical literature, posing challenges to the practice of fiscal policy in small island developing economies. Further, this result contradicts existing theories and calls for more encompassing theories of fiscal policy.

The next section briefly reviews the evolution of fiscal policy influential in decision-making on the fiscal front. Section 3 discusses the econometric approach, while section 4 presents the data and the estimation results. Finally, section five concludes.

2. An overview of fiscal developments in the Caribbean

During the last four decades, public finances in Caribbean posed challenges to policymakers given the countries' high dependence on developed countries markets because of their economic structure and small size. Trinidad & Tobago is an oil and natural gas exporter –which differentiate its fiscal dynamics from that of Barbados and Jamaica (more tourism-based). Unsurprisingly, Trinidad and Tobago's oil revenue has influenced the sustainability of government's fiscal position. About a decade ago, the country established an oil stabilization fund. Prior to that, the country used the windfalls prudently through saving a large fraction of the proceeds and investing in infrastructure and other projects for output diversification. The country, however, mismanaged the oil revenue during the 1980s via extensive subsidies to poor performing companies, consumers and labor leading to the 1983-1989 recession (Velculescu and Rizavi, 2005).

Throughout the study period, Barbados experienced persistent fiscal deficits. Jamaica had mostly deficits and few spells of surpluses, while Trinidad primarily had surpluses. Table 1 shows some indicators of fiscal policy and economic growth before, during and after recession. We can deduce that economic downturns (highlighted in gray) are usually associated with higher government deficits suggesting countercyclical policies either through discretionary adjustments and/or automatic stabilizers. On average fiscal debt to GDP ratio has been on an upward trend for Barbados, while Jamaica's ratio was consistently high and Trinidad's ratio persistently low.

Table 1 *– Fiscal indicators for Barbados, Jamaica and Trinidad and Tobago*

BARBADOS			
	Fiscal Balance/GDP (%)	Total debt/GDP (%)	Real GDP growth (%)
1971-1973	-4.4	22	2.2
1974	-5.3	26	-4.7
1975-80	-4	30	4.5
1981-82	-7.1	37	-4.1
1983-89	-4.6	47	3.7
1990-1992	-3.5	58	-4.2
1993-2000	-1.5	65	3.0
2001-2002	-4.8	73	-2.1
2003-2007	-3	78	3.4
2008-2009	-5.3	95	-2.1
2010-2012	-5.6	97	0.5
JAMAICA			
	Fiscal Balance/GDP (%)	Total debt/GDP (%)	Real GDP growth (%)
1973-1980	-5.7	95	-3.3
1981-1983	-8.7	115	2.2
1984-1985	-1.9	133	-2.2
1986-1995	1.6	111	4.5
1996-1998	-6.9	86	-1.2
1999-2007	-4.7	112	1.8
2008-2009	-9.8	114	-2.0
2010-2012	-8.0	124	0.2
TRINIDAD and TOBAGO			
	Fiscal Balance/GDP (%)	Total debt/GDP (%)	Real GDP growth (%)
1971-1982	1.1	16	5.2
1983-1989	-6.6	27	-4.5
1990-1991	-0.7	42	2.1
1992-1993	-1.5	54	-1.5
1994-2008	1.6	34	6.2
2009	-5.8	21	-3.5
2010-2012	-1.6	33	-0.5

Source: Central Bank of Barbados, Central Bank of Jamaica, Central Bank of Trinidad and Tobago, World Development Indicators (2012)

3. Methodology

Following Beetsma and Giuliodori (2010) and Bénétrix and Lane (2013, 2010), we employ structural VAR strategy to assess the pass-through effects of discretionary fiscal policy to real GDP in three Caribbean countries. Consider the four-variable reduced form VAR system:

$$X_t = A(L)X_{t-1} + U_t \qquad (1)$$

where: $X_t = (g_t, t_t, d_t, y_t)$ is the vector of endogenous variables containing real government spending, real tax revenue, debt to GDP ratio and real GDP respectively. $A(L)$ is an autoregressive lag

polynomial. The vector $U_t = (u_t^g, u_t^t, u_t^d, u_t^y)$ contains the reduced-form residuals, which in general will present non-zero cross-correlations.

In order to separate automatic fiscal changes from discretionary policy driven changes, the reduced-form residuals of government spending and tax revenue equations, u_t^g and u_t^t, presented as linear combinations of three types of shocks: (a) the *automatic response* of spending and net taxes to GDP and debt innovations; (b) *systematic discretionary response* of fiscal policy to the macro-variables in the system; and (c) *random discretionary fiscal policy* shocks, considered the truly uncorrelated structural fiscal policy shocks. Hence, the reduced-form residuals can be expressed as

$$u_t^g = \alpha_{g,y} u_t^y + \alpha_{g,d} u_t^d + \beta_{g,t} \varepsilon_t^t + \varepsilon_t^g \quad (2)$$

$$u_t^t = \alpha_{t,y} u_t^y + \alpha_{t,d} u_t^d + \beta_{t,g} \varepsilon_t^g + \varepsilon_t^t \quad (3)$$

where ε_t^g and ε_t^t are the 'structural' discretionary fiscal shocks. Given our interest is to analyze the effects of ε_t^g and ε_t^t on real GDP (y_t) and debt to GDP ratio (d_t), estimation of all $\alpha_{i,j}$ and $\beta_{i,j}$'s is required. Restrictions based on economic theory and behavior of policymakers, are spelt out on $\alpha_{i,j}$ which are necessary to identify the structural shocks and coefficients. Afterwards, the impulse response functions are generated which maps the adjustment path in time for the real GDP and debt ratio in response to the discretionary fiscal shocks. The impulse response analysis is a useful tool to explore the dynamic structure of the system.

4. Empirical analysis: data, results and discussion

4.1. Data

The study uses annual data to study the impact of fiscal shocks on the real output of Barbados, Jamaica and Trinidad and Tobago. Bénétrix and Lane (2013) show that the Perotti (2005) group of countries provides very similar results whether quarterly or annual data are employed. This suggests that automatic response shocks are relatively small compared to discretionary shocks. Hence, it is sufficient to utilize annual data. Moreover, the use of annual data provides conceptual advantages over quarterly data. For instance, Beetsma and Giuliodori (2010) argue that fiscal shocks uncovered with annual data are closer to the actual shocks since fiscal policy is not substantially revised within a year.

The annual data utilized include total debt to GDP ratio, (central) government expenditure, tax revenue and GDP. Central government spending is the sum of government consumption and investment, while tax revenue is defined as the government receipts less grants. All variables are in logarithms. Apart from debt ratios, the variables are first deflated using the GDP deflator. We use annual data covering the period 1971-2012. The data was obtained from the Central Bank of Barbados, Central Bank of Jamaica, Central Bank of Trinidad and Tobago, World Bank (2013) and IMF (2013).

4.2. Results and discussion

The four-variable system is ordered such that fiscal policy variables are first (i.e. public expenditure and tax revenue) since they are exogenous to the economy (see Burriel *et al.*, 2010 and Blanchard and Perotti, 2002). Similar to Burriel *et al.* (2010), we assume that expenditure decisions are prior to tax ones, which implies a zero value for $\beta_{g,t}$. Given our objective is to study the effects of fiscal policy shocks, the ordering of the remaining variables total debt to GDP ratio and GDP is immaterial to the results.

We also rule out any discretionary response of government spending to unexpected contemporaneous movement in economic activity, i.e. $\alpha_{g,y} = 0$. Because taxes and government spending are policy variables, there is no contemporaneous effect between them i.e. $\alpha_{t,g} = \alpha_{g,t} = 0$ (see Blanchard and Perotti, 2002). Combining these assumptions and using the optimal lags on the

structural VAR the system is identified and the resulting impulse responses for each country are as shown in Figure 1, 2 and 3. The impulse response function graphs show the response of real GDP growth and the debt ratio to government expenditure and tax shocks[1]. The results convey important information.

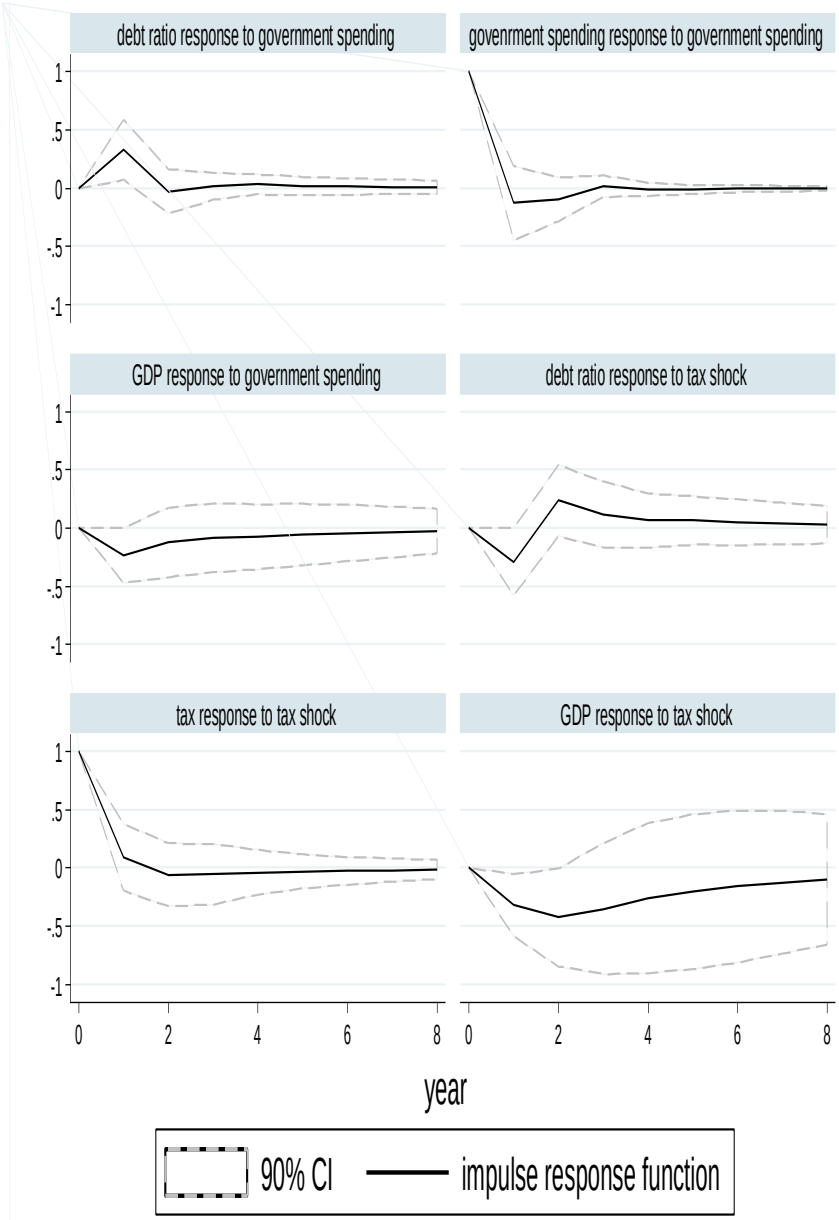

Figure 1. *Barbados' impulse response functions from 1% government spending and 1% tax shock*

Table 1 *– Unit Root Tests*

	Variable	Augmented Dickey Fuller		Philips Perron	
		Levels	First-difference	Levels	First-difference
Barbados	*g*	-1.969	-5.577***	-2.002	-5.558 ***
	t	-1.421	-5.418***	-1.403	-5.442***
	d	-2.146	-5.945 ***	-2.262	-5.916***
	y	-1.990	-3.066**	-2.201	-4.043***

[1] Note that the variables are in growth rates since the unit roots test could not be rejected. The first differences were stationary (see Table 1).

	Variable	Augmented Dickey Fuller		Philips Perron	
		Levels	First-difference	Levels	First-difference
Jamaica	*g*	-0.700	-5.917***	-0.770	-6.102***
	t	-2.250	-4.395***	-2.097	-5.042***
	d	-1.816	-3.741 ***	-2.255	-3.678 ***
	y	-2.468	-3.908***	-2.279	-3.863***
Trinidad & Tobago	*y*	-1.036	-2.947***	-1.381	-2.936***
	g	-1.792	-4.043***	-1.083	-4.445***
	t	-1.926	-4.340***	-1.966	-4.372***
	y	-1.036	-2.947*	-0.564	-2.936*

Notes: *, **,*** are the MacKinnon critical values for the rejection of the null hypothesis of a unit root at the 10%, 5% and 1% significance level respectively.

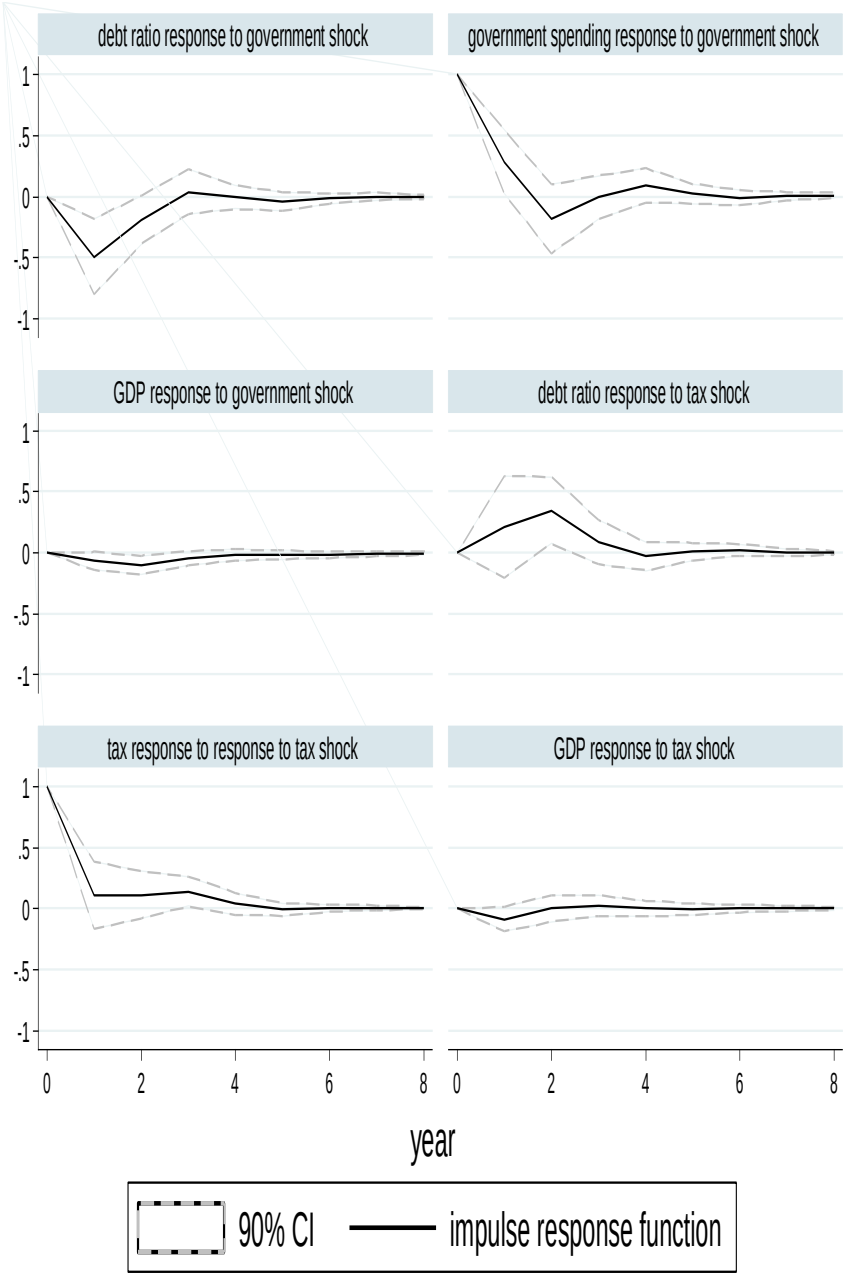

Figure 2. *Jamaica's impulse response functions from 1% government spending and 1% tax shock*

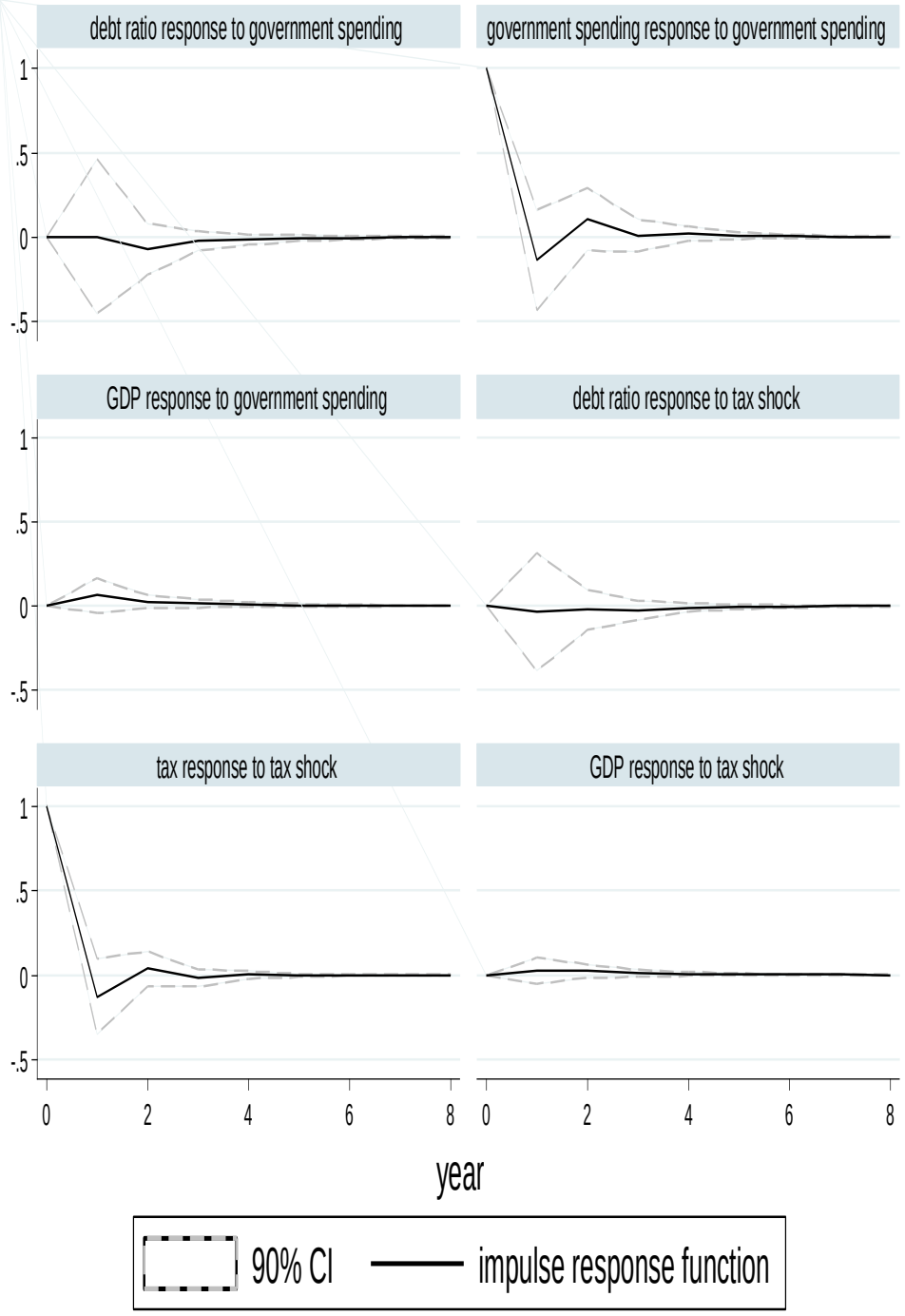

Figure 3. *Trinidad and Tobago's impulse response functions from 1% government spending and 1% tax shock*

For Barbados, a boost in government spending adversely affects growth. Precisely, a 1% increase in real government spending has a negative impact on real GDP growth of 0.23% the following year which gradually dissipates. This is not surprising given the country's persistent fiscal deficits. Evidence of negative fiscal multipliers in the form of expansionary fiscal contractions have been found in high-income countries (see Giavazzi and Pagano, 1990; Bertola and Drazen, 1993; Alesina and Perotti, 1995 and Alesina, 1997) and in low-income countries (see Gupta *et al.* 2002; 2005). The Barbados' case of contractionary fiscal expansions is a new empirical result. One plausible reason might be that the rise in government spending crowds out private investment. Evidence on "crowding-out effect" has been provided in literature (see for example Monadjemi, 1993; Ghali, 1998;

Voss, 2002). Alternatively, according to the Rahn curve, this may indicate that government spending is beyond its optimal level where increasing government spending results in lower growth. The contractionary fiscal expansions could also be a consequence of agents perceiving the expansion in government expenditure in the face of rising debt (and persistent budget deficits) as government breeching its intertemporal budget constraint, which would likely entail higher future taxes. This causes a reduction in market confidence leading to lower private investment and aggregate demand. Consistent with this, our estimates also indicate that an increase in government spending is associated with an increase in debt ratio. Precisely, a 1% positive government spending shock increases the debt ratio by 0.33% a year later.

Tax expansions negatively impacts Barbados' economic growth. A 1% positive tax shock results in a 0.32% increase in real GDP growth a year later followed by a 0.42% rise after two years. Thereafter the effect slowly dissipates. In other words, it is consistent with Keynesian predictions that tax expansions negatively affect economic activity. The same tax shock has no statistical impact on the debt ratio.

In the case of Jamaica, a 1% government spending shock has no statistical significant effect on real GDP. The ineffectiveness of government spending on economic activity is not surprising given the high debt levels in the country. Ilzetzki *et al.* (2013) postulated that highly indebted countries tend to exhibit lower output effect from increased government spending. Further the ineffectiveness might be a result of high corruption levels in the country, as poor governance is predicted to reduce the efficacy of public spending and administration, which hinders private investment and growth (Baldacci *et al.* 2004)[2]. However, the 1% expansion in government expenditure is followed by a 0.49% decline in debt during the next period, which quickly dissipates thereafter. One possible explanation is that government spending increases may have coincided with debt repayments. A 1% tax shock has no statistically significant effect on GDP growth and on the debt ratio.

As for Trinidad and Tobago, expansions in government expenditure boost growth. A 1% shock in government spending raise GDP growth by 0.06% in the first year and quickly dissipates thereafter. Similar spending multipliers of less than 1 have been found by Burriel *et al.* (2010) in the Euro area and the United States. This result supports the neo-Keynesians prescription for handling recessions. Nevertheless, the spending shock has no statistical impact on government's debt ratio, which maybe due to the countries large oil revenue. Additionally, tax shocks have no statistically significant impact on GDP and government debt.

From the above results, we conclude that generally discretionary fiscal policy in the Caribbean is very constrained. This could be due to their limited fiscal space, small economic sizes and high degree of openness. The same cannot be said for Trinidad and Tobago though.

Conclusion

This paper contributes to previous literature analyzing the effects of fiscal policy on economic activity. It assesses the effectiveness of fiscal policy in small open developing economies which rely heavily on fiscal policy for stabilization purposes. Applying structural VAR models to three Caribbean countries from 1971-2012, new results emerge. They indicate that injection of government funds is ineffective in triggering economic activity in the case of Barbados and Jamaica partly due to their high debt levels, small economic size and openness. Indeed in the Barbados case, positive government expenditure shocks have negative effects on GDP growth. This may suggest a crowding-out effect on private expenditure necessary for growth or agents' loss of confidence in government's finances (in anticipation of compensating with higher future taxes), which inhibits private investment and growth. The overriding conclusion is that, in Barbados, any attempt to stimulate growth through government spending to stave off recessions may actually exacerbate their devastating effects. This calls for new theories encompassing the possible negative effects of discretionary fiscal policy.

In Trinidad and Tobago, government spending has transitory positive effect on economic activity. The positive effect is partially attributed to the countries low debt and possibly the existence of oil revenues which provide significant fiscal policy buffers during recessions. Hence, when faced with economic recessions, the neo-Keynesian prescription is relatively more appropriate for Trinidad

[2] In 2009 out of 180 surveyed countries, Transparency International Corruption Perception Index ranked Jamaica 99th, compared to Barbados 20th and Trinidad 79rd.

and Tobago but inadequate for Barbados and Jamaica. However, the low impact raises questions as to the usefulness of discretionary fiscal policy for short-run stabilization purposes in Trinidad and Tobago.

In line with Keynesian theory, tax shocks are negatively related to GDP for Barbados. This result points to the effectiveness of tax reductions in stimulating the economy during recessions. As for Jamaica and Trinidad and Tobago, tax shocks have no statistical significance suggesting that any attempt to stimulate these two Caribbean economies with tax cuts may not yield desirable results. These findings are very informative to policymakers for containing recessionary effects and stimulating the economy.

The paper revealed that the effectiveness of neo-Keynesian fiscal policies may be tied to their funding. In other words, they are more effective in countries with fiscal space. Clearly, Jamaica and Barbados has very limited fiscal space, while we cannot argue the same for Trinidad & Tobago. Consequently, the results provide valuable lessons for the effectiveness of stabilization policies in small island developing nations with restricted fiscal space.

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FORECASTING TURKEY'S ENERGY DEMAND USING ARTIFICIAL NEURAL NETWORKS: FUTURE PROJECTION BASED ON AN ENERGY DEFICIT

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Abstract:

As Turkey has limited energy resources and satisfies a large part of its energy needs using foreign resources, this study evaluates Turkey's current energy conditions and presents a set of energy projections to contribute to the country's future plans, programmes and policies. Based on the widespread view that the energy deficit is one of the most important constraints on Turkey's sustainable growth, this study presents a set of predictions covering Turkey's energy production and consumption for the nine-year period between 2012 and 2020. Based on the results, this study also proposes a set of solutions.

In this study, a projection of Turkey's energy production is made by considering the energy production targets of existing plants and the new energy plants that are planned to be completed in the projected future. In addition, the energy demand is forecasted by using a type of artificial intelligence model known as an artificial neural network.

Keywords: energy demand, energy deficit, forecasting, artificial neural networks.

JEL Classification: C45, Q41, Q47

1. Introduction

Historical analyses of social development reveal that all efforts are intended to improve social welfare. Social welfare can be enhanced by increasing the amount of goods and services available to society. Today, the level of economic development is used as an important criterion for designating a given country's level of development. In parallel, one of the most important factors for designating the level of economic development is the level of production. A country's level of development is based on its level of production with respect to information, technology, goods and services as well as its ability to convert these four elements into economic and social utility. Hence, the literature on economics emphasises the significance of examining and comprehending the factors that facilitate growth, especially sustainable growth. Ensuring production and economic growth requires a series of basic inputs, one of the most important being energy.

As an input required at all stages of production and an element required for increasing a society's standard of living, energy is one of the most significant components of economic and social growth. Due to this great significance, energy cannot be viewed simply as a matter of input for production. Instead, energy is interpreted as an issue that shapes the world economy and world politics, a strategic commodity that constitutes the essential element of international relations and a determinant of the economic, social and geographical order of the world. States' desires for the possession, control and dominance of energy resources reflect the indispensable nature of energy in not only the realm of economics but also that of politics.

For any state, reaching a particular level of economic growth is possible only with a supply of uninterrupted, high-quality, safe energy. Producing goods and services, providing these goods and services to consumers and keeping this process sustainable are not possible without the use of energy. Therefore, any problem concerning the procurement of energy or meeting increasing energy needs with suitable costs creates a production bottleneck for the economy.

If local energy resources are insufficient, the continuous and affordable procurement of energy may not be possible under given market conditions. The method of energy procurement, the problems faced during this procurement and the impact of energy on national and international competition, countries' production structure, budgetary equilibrium and external deficit make energy a significant item on states' agendas.

Turkey's energy needs are increasing in parallel with the country's growing economy and changing socioeconomic structure. The disparity between the sharply increasing need for energy and the lesser increase in energy production creates an energy deficit, which is highly problematic. Under these conditions, Turkey must either consent to a low rate of development based on available resources or attempt to increase its level of production by compensating for its energy needs using foreign energy resources in addition to available domestic resources. Turkey primarily relies on its domestic resources when striving to achieve the required level of production. Nevertheless, because Turkey does not possess enough energy resources to provide the demanded energy, it acquires the rest of its energy needs from foreign resources. This obligation increases the rate of energy product import, thereby increasing the country's current account deficit and the amount of money paid in each bill by society. Moreover, in addition to the high cost of these imported energy resources, their control by only a few states creates the possibility of an energy crisis if the diplomatic relations between these countries worsen or cease. Such uncertainties regarding energy procurement in Turkey lead to inconsistent growth and reduce the level of welfare.

Turkey satisfies more than 70% of its energy needs from foreign resources, and this rate is constantly increasing. Thus, the energy deficit is a very important problem that begs a solution. In this regard, the procurement of the energy needed for sustainable growth and reducing the need for foreign resources depend, first and foremost, on the planning of investments in energy. Planning requires an accurate designation of energy needs and resources as well as the balancing of production and consumption. Energy needs must be predicted based on macroeconomic goals and energy investments and agreements must be made accordingly. Such energy planning has to consider the middle- and long-term economic growth inclinations of Turkey, correlate its population growth rate and social needs with its energy needs and ultimately produce a realistic plan that reflects the needs of the country. That is, the demand predictions must be accurate to create plans based on energy needs.

These energy consumption predictions are needed for both determining future capacity- and investment-related needs and ensuring that energy agreements meet these needs. By contrast, if no predictions are made or if these predictions are not made accurately, then the dissemination of resources is suboptimal and resources are wasted. In this regard, for Turkey to ensure consistent economic development, it has to meet the increasing demand for energy, which is one of the most important inputs for production. In turn, meeting this demand requires an accurate prediction of energy needs and demand.

The aim of this study is to provide predictions of Turkey's energy demand to facilitate the safe and reliable procurement of energy in the near future. Additionally, this study aims to provide guidance to decision-makers and market shareholders for the timing of the establishment of new facilities; the quantity, composition and purchase of energy resources; and the features of possible new energy agreements. An accurate prediction of energy demand is a prerequisite for designating the amount that should be invested in the middle and long term, the level of future capacity increases and the features of possible energy-related agreements. Thus, such predictions are very important for balancing energy supply and demand. The more accurate and reliable the predictions are, the more valid the plans will be.

In this study, we will evaluate the energy deficit and energy production predictions for Turkey for the next nine years (2012-2020) using the artificial neural networks method. We have chosen this prediction method due to the success of artificial neural networks, especially in non-linear time series (Tang *et al.*, 1991; Zhang *et al.*, 1998). Next, Turkey's energy production capacity projection based on the energy production facilities that are already built, under construction or licensed for construction in the future will be evaluated along with the prediction results of the artificial neural networks. The acquired data will be used to determine the physical and financial extent of the energy deficit. Based on these results, a set of resolution strategies will ultimately be offered.

2. Literature review

Predictions of energy demand have great importance for supply-demand equilibrium. Energy demand predictions that are higher than the actual demand cause the existing supply capacity to become stagnant, especially for countries that possess limited energy resources, such as Turkey. The inability to allocate available resources to other areas leads to irrational resource allocation and waste. The cost of resource waste resulting from inaccurate predictions manifests as a decrease in the level of

welfare along with a halt in economic growth (Karagöl, 2009: 7). On the other hand, energy planning based on predictions that underestimate actual figures force the implementation of austerity measures and cutbacks. Thus, there is a need for the mathematical modelling of energy resources allocated for use, the demand for these resources and the development of prediction models in line with these mathematical models.

Although energy prediction has been a focus of study in Western states for some time, studies on energy demand prediction began in Turkey with the prompting of the World Bank as late as 1984. Since then, energy demand predictions for Turkey have been created using the Model for Analysis of Energy Demand (MAED) officially implemented by the Ministry of Energy and Natural Resources (Atılgan, 2000: 42). Nevertheless, studies have shown that this model has not provided Turkey with reliable results for the medium and long term (Kumbaroğlu, 2006: 1; Karakaya, 2008: 357; Hotunluoğlu and Karakaya, 2011: 87). The generalised prediction values and actual values show dramatic differences in terms of ratios. Therefore, the development of energy prediction models as alternatives to the MAED is no longer a matter of choice but of necessity. Thus, an increasing number of academicians, experts and personnel in related institutions have been conducting demand-prediction studies independently of the Ministry of Energy and Natural Resources (MENR). Leaving aside the official projections presented by the Ministry, energy demand projections for Turkey are based on two major methodologies: economic models and artificial intelligence models.

The number of energy demand studies in Turkey has recently been increasing; many experts and academicians have been conducting such studies using intuitive algorithms. A literature survey reveals that the studies conducted using artificial intelligence models can be categorised based on whether general artificial neural networks (Hamzaçebi and Kutay, 2004; Murat and Ceylan, 2006; Sözen, 2009; Hotunluoğlu and Karakaya, 2011), genetic algorithms (Ceylan and Öztürk, 2004; Haldenbilen and Ceylan, 2005) or ant-colony (Toksarı, 2007; Toksarı, 2009; Kıran *et al.*, 2012) methods are utilised.

Hamzaçebi and Kutay (2004) predict Turkey's long-term energy consumption up to 2010 using the country's energy consumption and population data for the years 1970-2002. The study combines artificial neural networks with conventional econometric methodologies, such as time-series analysis (AR, MA and ARIMA) and regression techniques. Ceylan and Öztürk (2004) attempt to predict the energy demand of Turkey for the year 2025 using a genetic algorithm technique. In Ceylan and Öztürk's study, the future energy demand of Turkey is predicted using GDP, population, import and export data for Turkey for the years 1970-2001. Sözen *et al.* (2005) used artificial neural network to determine the future amount of energy consumption in Turkey. In the study, two different models were used in order to train the neural network. In one of them, population, gross generation, installed capacity and energy data from 1975 to 2003 are used in the input layer of the network. Other energy sources are used in input layer of network. Murat and Ceylan (2006) present a prediction for the transportation sector for the years 2002-2010 using artificial neural networks with gross national product (GNP), population and kilometres travelled per car as explanatory variables. Kavaklıoğlu *et al.* (2009) utilise artificial neural networks to predict the electricity consumption of Turkey up to the year 2027. In the study, frequently used economic data such as GNP, population and import and export values for the years 1975-2006 are used to predict future energy consumption. Yet another study in which GDP, population and export and import data are used is Toksarı (2009), in which the attempted prediction is Turkey's electricity consumption for the year 2025. Toksarı's study utilises data from the period 1984-2004 along with the ant-colony optimisation method. Hotunluoğlu and Karakaya (2011) utilise the artificial neural networks technique, wherein they make use of a data series including Turkey's GDP, population, import and export levels and energy intensity for the years 1970-2008 to predict the country's energy demand in the year 2030. In another study, Yiğit (2011) uses GDP, population and import and export data as explanatory variables and attempts to predict the electricity energy consumption of Turkey up to 2020 utilising a genetic algorithm approach.

Econometric models other than intuitive algorithm techniques also allow for predictions of the demand for both general energy and a variety of energy resources, such as electricity, natural gas and petroleum. Studies that present energy demand predictions using econometric modelling occupy considerable space in the literature. A literature review would reveal that a larger number of the studies in this area concentrate on regression analysis (Yumurtacı and Asmaz, 2004; Görücü and Gümrah, 2004; Say and Yücel, 2006; Ediger and Akar, 2007).

Yumurtacı and Asmaz (2004) provide a prediction of Turkey's energy consumption up to 2050 using a linear regression technique. Görücü and Gümrah (2004) present a prediction of the natural gas consumption of Ankara for the year 2005 using multiple regression analysis. To predict natural gas use, Görücü and Gümrah use the temperature, number of consumers, gas sales prices and exchange rates for 1991-2001 as variables. Say and Yücel (2006) provide a prediction of Turkey's energy demand for the year 2015 using the linear regression method. Ediger and Akar (2007) provide a prediction of Turkey's primary energy demand from 2005 to 2020 using primary energy consumption levels over the period 1950 - 2004 via the autoregressive integrated moving average (ARIMA) and seasonal ARIMA (SARIMA) methods. Erdoğdu (2007) presents a prediction of Turkey's electricity demand up to 2014 using the real electricity prices and real GDP per capita of Turkey over the period 1984-2004.

3. Methodology

3.1. Artificial neural networks (ANNs)

One of the newest and best examples of efforts to research, comprehend and imitate nature is artificial neural networks technology, which allows computers to learn. In recent years, the superior qualities of the human brain have drawn researchers' attention, and researchers have attempted to build a mathematical model of the neurophysical structure of the brain (Ataseven, 2013: 102). Inspired by the working system of biological neural networks, an artificial neural network is a programming system that aims to replicate the human brain's ability to create and form new ideas, discover and make quick decisions under different conditions via simplified models (Öztemel, 2012: 29). On the other hand, artificial neural networks can also be described as profound processors that are built to mimic the retention and utilisation features of the human brain (Hamzaçebi, 2011: 11). Artificial neural networks are designed to possess human-like capabilities, such as learning and remembering and updating what they have learned. Using performance features similar to those of biological nerve networks, ANNs are able to make generalisations, collect information and easily make decisions based on prior examples (Fausett, 1994: 3; Zhang *et al.*, 1998: 35). That is, ANNs execute a decision-making process that is highly similar to that of humans, in which traditional methods can be used to solve difficult and complex problems. Within this framework and motivated by the principle that an accurate modelling of all actions of the human brain requires an accurate modelling of its physical components, a number of artificial cells and network models are currently being developed.

Artificial neural networks are systems composed of a number of artificial neurons working together. This unification creates a structure composed of interconnected layers (Hamzaçebi, 2011: 13). The structure of a given network is defined by the shape of the network and the layer structure of the operating units. The structure of an artificial neural network consists of three major layers: the entry layer, where interconnected neurons are located; the mid-layer, also known as the hidden layer; and the output layer (Öztemel, 2012: 52). An example of such a structure is presented in Figure 1. Information and examples are inputted via the entry set, and the output values are obtained as the output set. The first layer, the input layer, facilitates the transfer of incoming data to the mid-layers. In econometrics, these data consist of the independent variables. The final layer, the output layer, processes the data transferred from the mid-layer and produces output for the input layer of the network. The produced output is then sent to the "outer world". In econometrics, these data, in contrast to previous types of data, consist of dependent variables (Budak and Erpolat, 2012: 26). Located between the input layer and the output layer and referred to as the hidden layer, the mid-layer processes the data received by the input layer and sends it to the output layer. Hidden layers do not have connections to the outer environment, and there may be more than one mid-layer in a network (Öztemel, 2012: 53). Choosing the number of neurons in the hidden layer and the size of the network are important for the performance of the network. The number of hidden layers and changes in the number of neurons impact the network, determining whether the network has a simple or a complex structure (Küçükkocaoğlu *et al.*, 2007: 11). The more layers and neurons a network has, the more complex it is.

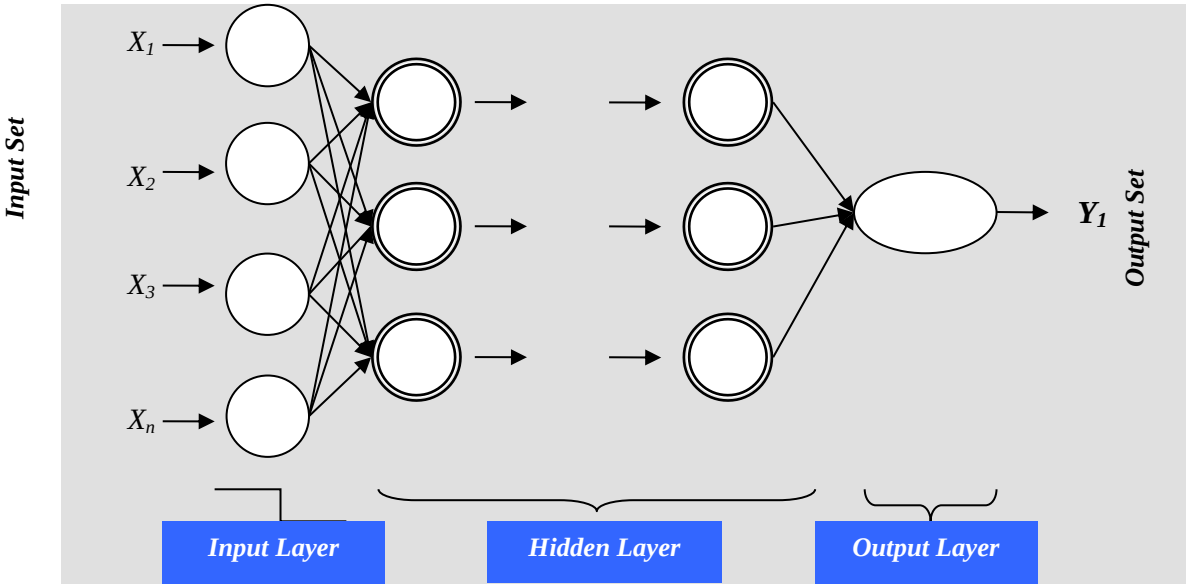

Figure 1 *- Typical processing element of an artificial neural network*

4. Empirical results

This section provides information on the data set and resources used in this study, explain the preparations made for data processing and evaluates the results of the artificial neural networks used for the data analysis. In addition to the estimated results are compared with estimates of MENR's energy demand. The numerical analysis software MATLAB 2011b has been used to model the artificial neural networks.

4.1. The data set

Four different parameters (real GDP, population, export and import), each of which define the level of energy consumption, were used in this study as the input parameters of the artificial neural network, whereas the consumption values of energy resources (EC) were used as the output parameter. The data used in the study covered the period 1960-2011, and suitable models were sought for the given period. The real gross domestic product (GDP) was acquired from the World Development Indicators (WDI) database of the World Bank and the National Calculations Statistics database of Turkish Statistical Institute (TurkStat). The population (POP) data were acquired from the Address-Based Population Registry System (ABPRS) database of TurkStat. The import (IM) and export (EX) data were acquired from the Foreign Trade Statistics database of TurkStat and the State Planning Organisation. Data regarding primary consumption in previous years were acquired from the energy database of the Ministry of Energy and Natural Resources and the World Development Indicators database of the World Bank.[3] The general functional expression of the primary energy consumption model is as follows:

$$EC = f(GDP, POP, EX, IM) \qquad (1)$$

The raw data to be used in the development of the ANN model must be normalised prior to initiating the learning of the network to prevent any mistakes in the learning process. Normalising the data allows for each of the parameters in the learning input set to provide an equal contribution to the prediction operation of the model. Therefore, the input and output data are normalised prior to the learning of the network using equation (2).[4]

[3] Whereas the energy consumption data for the 42-year period 1970-2011 were acquired from the MENR database, the data for the period 1960-1969 were acquired from the World Development Indicators database provided by the World Bank.

[4] See (Priddy and Keller, 2005) for detailed information.

$$X_i = 0{,}8\ \frac{(X_t - X_{min})}{(X_{max} - X_{min})} + \ 0{,}1 \qquad (2)$$

In equation (2), X_{min} and X_{max} constitute the minimum and maximum values of the parameters given in the data set, whereas X_i are the normalised counterparts of data X.

4.2. Establishing the network architecture

The performance of a model is closely related to the accurate development of the model's architecture. The modelling of any event via artificial neural networks can be realised by designating the most suitable network architecture for the given event. This requires the selection of the network architecture that is most suitable for the structure of the network, its functioning and the event in general; the selection of the network's structural features (number of layers and the number of operation elements at each layer); and the designation of the characteristic features of the functions used by the elements in the model's operation (Eren and Turp, 2011: 402). The evaluation of network performance requires consideration of the mean squared error (MSE) and the determination coefficient (R^2). A MSE coefficient close to 0 indicates that the difference between the output of the network and the desired output is small. If the MSE is 0, there is no difference between the output of the network and the desired output, and the results are error-free. R^2 is used to assess the strength of the relationship between the output of the network and the desired output. An R^2 value close to 1 corresponds to a nearly perfect relationship between the network output and the desired output (Yaprak and Karacı, 2009: 26). In this framework, conjugate gradient backpropagation with the Powell-Beale algorithm (traincgb), which offers the lowest MSE and the highest R^2, should be chosen as the learning algorithm that gives the best solution to the problem.

After designating the most suitable learning algorithm for the problem, the completion of the network architecture requires the definition of the number of hidden layers and the number of operating elements in the hidden layers. Because using only one layer is sufficient for this study, to build the best single-hidden-layered network architecture, the optimal number of operating elements in the hidden layer will be determined via trial and error.

A series of trials were conducted to determine the optimal number of operating elements in the hidden layer. A range of operating elements was tested, varying from 5 to 10, and error analysis was conducted using the measured and predicted values. Thus, based on trial and error, the impact of the number of operating elements in the hidden layer on the performance of the ANN models used was investigated for a single-hidden-layer ANN architecture. Because the use of 10 operating elements led to the lowest MSE, a network architecture consisting of a single hidden layer and 10 operating elements was selected as optimal for solving the problem explored in this study. Figure 2 illustrates the artificial neural network used in the study.

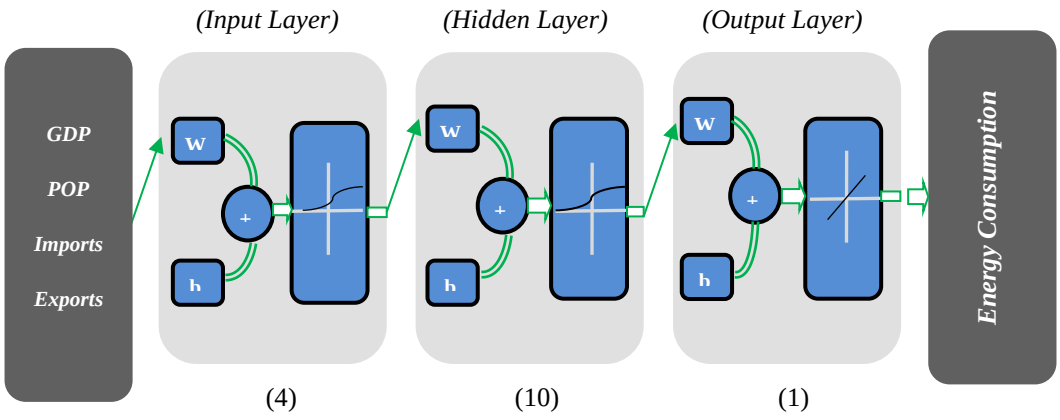

Figure 2 - *The artificial neural network model used in this study*

The artificial neural network model designed within the scope of this study includes four input variables and one output variable. The model is a neural network composed of one hidden layer and is feed forward and backpropagating. The input layer features four input operating elements that belong to four independent variables (GDP, population, export and import), and the output layer features one output operating element that belongs to one independent variable (energy production). There are also 10 operating elements in the mid-layer. This number of elements was determined based on a series of trials with different numbers of operating elements and was chosen due to its high explanatory power. With respect to the network structure, "logsig" was used as the activation (transfer) function at the first and second layers, and the "purelin" function was used in the output layer, which constitutes the last layer. The network type was defined as a feed forward backpropagating algorithm, and "traincgb" was chosen as the learning function. The artificial neural network model developed via a statistical comparison of the actual measurement results and the prediction results of the 4-10-1 network architecture model (which provided the best energy consumption model) demonstrated a very good prediction capability. Furthermore, A multi-layer feed forward neural network structure shown in Table 1 was proven to be capable of predicting energy consumption values.

Table 1 - *Structure of the multi-layer feed-forward ANN*

```
net = newff(minmax(p),[4 10 1],{'logsig','logsig','purelin'},'traincgb');
net.trainParam.epochs = 1000;
net.trainParam.min_grad=1e-6;
net.trainParam.mu=0.0001;
net.trainParam.mu_inc=2;
net.trainParam.max_fail=5;
net.trainParam.show=10;
net.trainParam.goal=0;
net.trainParam.showCommandLine=0;
net.trainParam.showWindow=1;
[net,tr] = train(net,p,t);
a = sim(net,p);
```

Here, p represents the input data set of the network, whereas t represents the output data. The sim command is used for the simulation of the designed network. In this context, a simulation refers to entering a data set into the network as input and having the network calculate the output. The show parameter indicates the number of iterations required for the learning condition to be reflected on the MATLAB screen, the epoch parameter indicates the number of iterations and the goal parameter indicates the targeted error value. The iteration number indicates the number of times the learning algorithm will be applied to the learning set prior to the completion of the learning operation. The goal parameter indicates the sum of squared errors that indicate when the cycle (epoch) must be completed. If this error rate is not reached after a maximum of 1000 epochs, the learning will be considered unsuccessful. The learning operation is stopped whenever the learning iteration number exceeds the epoch value, the performance function falls below the goal parameter or the gradient level falls below the min_grad parameter. As shown in Figure 3, the targeted error rate was reached at the end of the 329th epoch or iteration, and the learning operation of the network was ceased.

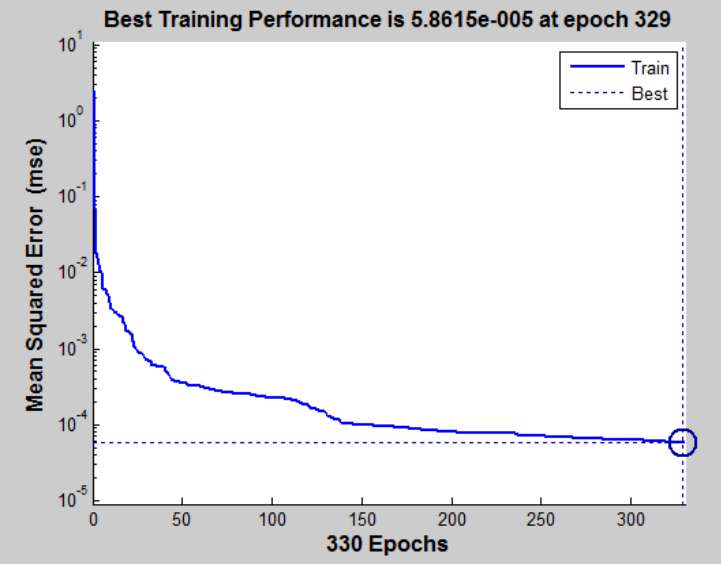

Figure 3 *- Objective and performance curves designed according to artificial neural network model*

The performance of the network was evaluated using the mean squared error (MSE) and the determination coefficient (R^2). A decrease in the iteration and mean squared error during the learning operation of the modelling is depicted in Figure 3. As shown in the figure, the neural network reaches its smallest error value at the 329th iteration (MSE = $5{,}86.10^{-4}$) and realises the best learning at this stage.

The prediction results were assessed using the MSE (mean squared error), RMSE (root mean square error), MAE (mean absolute error) and MAPE (mean absolute percentage error) techniques.

$$\text{MSE} = \frac{1}{n}\sum_{i=1}^{n}\varepsilon_i^2 = \frac{1}{n}\sum_{i=1}^{n}(\chi_i - y_i)^2 \quad (3)$$

$$RMSE = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\varepsilon_i^2} = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(\chi_i - y_i)^2} \quad (4)$$

$$MAE = \sqrt{\frac{1}{n}\sum_{i=1}^{n}|\chi_i - y_i|} \quad (5)$$

$$MAPE = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\left|\frac{\chi_i - y_i}{\chi_i}\right| * 100\%} \quad (6)$$

Here, ε_i^2 indicates the prediction error squared for period i, X_i indicates the real value for period i, y_i indicates the prediction value for period i and n indicates the number of periods. The performance values of this chosen network architecture (4-10-1) are summarised in Table 2.

Table 2 - Results for the best ANN architecture

	Performance Criteria				
	MSE	**RMSE**	**MAE**	**MAPE**	**R**
The Error Values	0,0000586	0,006195	0,005219	2,479348659	0,9994

The prediction values acquired from the model and the measurements of the real values yield the following results: MSE = $5{,}86.10^{-4}$; RMSE = $6.19.10^{-2}$; MAE = $5{,}22.10^{-2}$; MAPE = 2,48%. The lowest MSE, RMSE, MAE and MAPE values show that the deviations between the real energy

consumption values and the predicted values acquired from the artificial neural network model are very small. The fact that the MAPE values are below 10% indicates that the prediction model is in the "highly reliable" category (Witt and Witt, 1992: 101). As clearly observed in Table 2, the developed ANN model accurately predicts the primary energy consumption level.

Moreover, the R^2 value in Table 2, 0,9994 (R^2 = 0,99882), which is quite close to 1, indicates that the output of the network is correct and consistent with the desired output.

The similarities between the data values produced by the developed artificial neural network model and the prediction results of the model are shown in Figure 4.

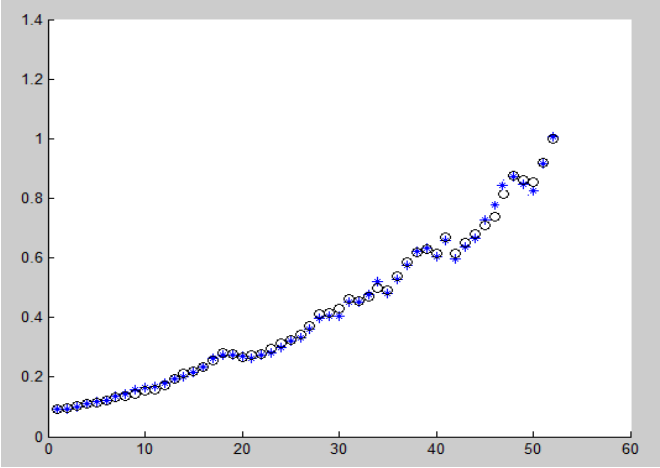

Figure 4 *- The primary energy production values of Turkey and the prediction results of the model (1960-2011)*

This study shows that the energy production values predicted by the ANN are quite close to actual past values (Figure 4). This result demonstrates that the energy consumption values predicted via the ANN model will be close to the real values. Thus, the values predicted using this model can be used to elucidate the energy consumption potential of Turkey in such applications as energy planning.

4.3. The results acquired using the best network architecture

After receiving positive results from both the assessment of the learning of the designed artificial neural network and the performance tests, the primary energy consumption values for the period 2012-2020 were calculated based on the annual values observed over the period 1960-2011.

The predictions of the primary energy consumption of Turkey for the period 2012-2020 acquired using the artificial neural network models are shown in Table 3. Figure 5 compares the prediction results of the energy consumption of Turkey acquired by the ANN models and the predictions provided by the Ministry of Energy and Natural Resources for the years 2012-2020.

Table 3 - Turkey's primary energy demand for the years 2012-2020 determined using the ANN model

	ANN	MAED[a]
2012	117.546	142.861
2013	122.432	150.890
2014	129.635	160.211
2015	137.509	170.154
2016	142.856	178.455
2017	145.378	187.923
2018	147.219	198.911
2019	149.677	210.236
2020	152.492	222.424

[a] MENR's annual energy demand projections through 2020 (MENR, 2012: 20)

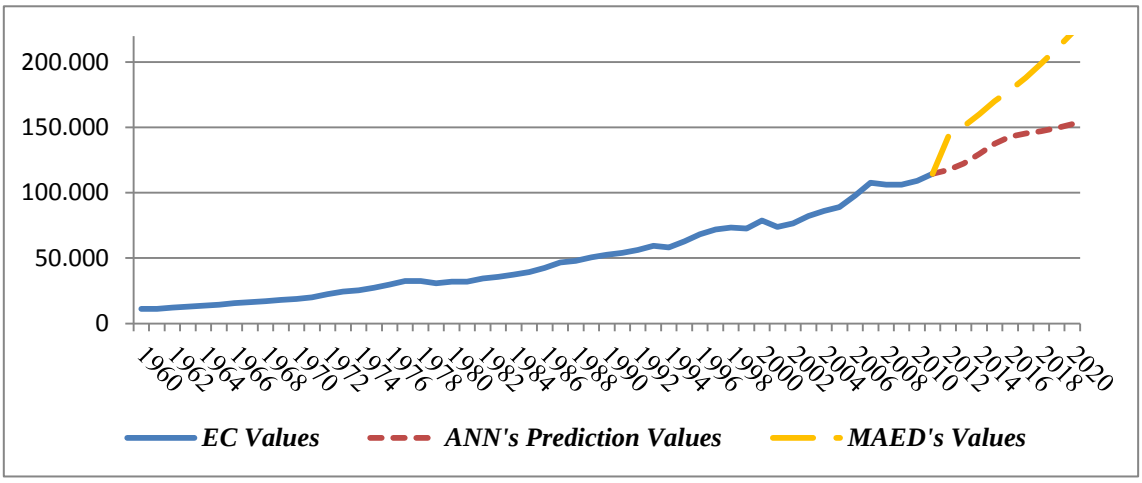

Figure 5 - Predictions of Turkey's future primary energy consumption (in thousands of TOEs)

Table 3 compares the findings of our models and the results provided by the Ministry of Energy and Natural Resources (MENR) acquired using the Model for the Analysis of Energy Demand (MAED). According to the MENR's projections, Turkey's primary energy needs will be 170,154 thousand TOE (tonne oil equivalent) in the year 2015 and 222,424 thousand TOE in the year 2020. Hence, the results provided by the MENR reflect a growth of 56%. In contrast, the results of the analyses conducted in this study show that the annual energy demand, which was 114,480 thousand TOE in the year 2011, will increase by 3.2% annually, reaching 137,509 thousand TOE in 2015 and 152,492 thousand TOE in 2020. A comparison of the results shows that the values provided by the Ministry are strikingly higher than those presented in this study. When the predictions of the MAED model are closely evaluated, significant proportional differences between the predicted energy demand values and the present actual values are observed. Thus, the MAED model does not provide reliable results for middle- and long-term predictions (Kumbaroğlu, 2006: 1; Karakaya, 2008: 357; Hotunluoğlu and Karakaya, 2011: 87). Here, the 6% energy demand expectancy presented in the 2012-2020 energy demand predictions of the MENR is in fact the rate of demand when the growth rate is highest. The sustainability of such a high growth rate does not seem possible over the nine years that follow. Therefore, the artificial neural network model developed in this study can be considered more suitable and effective.

5. Energy deficit predictions for Turkey for the period 2012-2020

As a rapidly developing country that has drawn attention in the international arena due its recent high growth rates, Turkey is expected to witness an increase in its energy needs. In this study, a projection of Turkey's energy production is made by considering the energy production targets of existing plants and the new energy plants that are planned to be completed in the projected future. In addition, the energy demand is forecasted by using a type of artificial intelligence model known as an artificial neural network. Turkey's predicted energy deficit and the cost of exported energy inputs for the nine-year period between 2012 and 2020 are shown in Table 4.

Table 4 - The predicted energy deficit of Turkey and the cost of exported energy inputs (2012-2020)

	Energy Production (thousand TOE)	Energy Consumption (thousand TOE)	Energy Deficit (thousand TOE)	Energy Deficit (%)	Energy Cost (000,0 $)[b]
2011[a]	32.229	114.480	82.251	72%	56.903.208
2012	42.828	117.546	74.718	64%	51.691.698
2013	44.888	122.432	77.544	63%	53.646.792
2014	49.452	129.635	80.183	62%	55.472.516
2015	54.124	137.509	83.385	61%	57.687.736

	Energy Production (thousand TOE)	Energy Consumption (thousand TOE)	Energy Deficit (thousand TOE)	Energy Deficit (%)	Energy Cost (000,0 $)[b]
2016	56.244	142.856	86.612	61%	59.920.252
2017	58.634	145.378	86.744	60%	60.011.572
2018	61.599	147.219	85.620	58%	59.233.962
2019	63.774	149.677	85.903	57%	59.429.748
2020	65.704	152.492	86.788	57%	60.042.013

[a] Realised energy values
[b] The price of crude oil per barrel reflects the closing rate for the end of the year 2012. One barrel of petroleum equals 42 gallons. One gallon equals 3.79 litres. Thus, 1 barrel of petroleum equals 42 * 3.79 = 159 litres. Energy Cost = [[(3)*1000000]/159]*110.

Source: Energy production values are compiled from the MENR's annual energy projections through 2020. (MENR, 2012: 21). Energy consumption values are prediction results of the model (ANN), and the other values are calculated by the authors.

The energy production[5] and consumption projections made in this study show that the general energy demand, which was 114,480 thousand TOE in the year 2011, will increase by 3.2% annually, reaching 137,509 thousand TOE in 2015 and 152,492 thousand TOE in 2020 (Table 4). The general energy production, which was 32,229 thousand TOE in the year 2011, is expected to increase at an annual rate of 8.6%, reaching 65,704 thousand TOE in 2020. Due to the increase in the demand for energy, which has quite exceeded actual production possibilities, the primary energy deficit of Turkey for the year 2011 was 82,251 thousand TOE; this figure corresponds to a 72% foreign dependency rate for energy. Under the assumptions that the designed remediation works are realised and nuclear energy plants are constructed by their projected completion dates, Turkey's energy deficit is expected to reach 83,385 thousand TOE in the year 2015 and 86,788 thousand TOE in the year 2020. During this period, the 72% foreign dependency rate for energy for the year 2011 is expected to decrease to 61% in 2015 and 57% in 2020. That is, export goods in energy consumption are expected to decrease in the following decade. Moreover, the 56.9 billion dollar cost of total energy exported in the year 2011 is expected to decrease to 60 million dollars in the year 2020 (Table 4).

Conclusion and evaluation

Viewing energy deficit as one of the largest constraints of Turkey's sustainable growth, this study has presented the development and current level of energy deficit in Turkey and projected the energy deficit and energy consumption for the coming nine years. Projections of Turkey's energy production have been made based on the energy production facilities that are already built, under construction or licensed for construction in the future. Additionally, energy consumption projections have been made based on projection modelling using artificial neural networks. In this framework, the projections of the energy demand for the years 2012-2020 are based on variables for the period 1960-2011. Based on the energy production and consumption projections made using the given data, the general energy demand is expected to increase at an annual rate of 3.2%, reaching 152.492 thousand TOE in 2020. Energy production is expected to increase at an annual rate of 8.6% and reach 65,704 thousand TOE in the year 2020. Due to a sharp increase in the demand for energy, which has far exceeded the actual production capacity, Turkey's primary energy deficit was 82.251 thousand TOE in the year 2011. Under the assumptions that the designed remediation works are realised and nuclear energy plants are completed on the projected dates, Turkey's energy deficit is expected to reach 86,788 thousand TOE in the year 2020. During this period, the 72% foreign dependency rate for energy for the year 2011 is expected to decrease to 57% in 2020. That is, export goods in energy consumption are expected to decrease over the following decade. Moreover, the 56.9 billion dollar

[5] In this study, energy production projections are assumed to be autonomous, and the general energy production projections are taken from data provided by the Ministry of Energy and Natural Resources (MENR, 2012). When the energy projections are considered, the year 2012 shows an increase as high as 33%. However, an increase of 33% for the year 2011-2012 is questionable. Such projections have to be reconsidered in energy planning.

cost of total energy exported in the year 2011 is expected to decrease to 60 million dollars in the year 2020. After the completion of the already designed remediation projects and nuclear power plants on the planned dates, the local energy production is expected to meet the energy demand at an increasing rate. However, a 57% dependency on foreign energy resources is still comparatively high. Therefore, to reach energy equilibrium without increasing the current account deficit and without making any sacrifices in the growth rate, the first priority should be developing and utilising currently available energy resources. Other significant steps that can be made toward this end are the diversification of energy resources and the efficient use of available resources.

It is not possible for Turkey to improve its energy supplies completely independently, nor is it possible for Turkey to secure a stable energy supply by itself and decrease its dependency on foreign resources. Although developing the energy supply might be of significance, reducing the demand for energy and spreading energy savings to all layers, thereby transforming the Turkish economy into one that uses energy efficiently, is an equally important part of the solution to Turkey's energy problem. Turkey's current account deficit resulting from an inefficient use of energy in both production and consumption hinders the procurement of energy and makes Turkey more sensitive to energy-related foreign shocks. Therefore, austerity measures are required at all levels of energy consumption. Losses in the transmission and distribution of energy must be remedied via necessary infrastructural work, the implementation of modern transportation systems and renovation. Therefore, securing energy supplies, diversifying energy resources, as well as the regions from which energy is procured, and increasing the efficiency of the available energy resources should be the priorities in reducing Turkey's foreign dependency on energy.

The results of the energy demand estimations found by us are compared with the official estimations of the MENR. A comparison of the results shows that the values provided by the Ministry are strikingly higher than those presented in this study. When the predictions of the MAED model are closely evaluated, significant proportional differences between the predicted energy demand values and the present actual values are observed. Thus, the MAED model does not provide reliable results for middle- and long-term predictions. In future energy planning and decision-making process, it is suggested to take other academic studies, methodologies and their findings into consideration.

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THE ACCOUNTING TREATMENT OF TOURISM SERVICES CASE STUDY OF ROMANIA

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Abstract:

Business success depends, primarily, on the path a travel agency is about to choose that can be a mediator, a reliable partner and an opportunist. A name in tourism is made with patience, constant effort and quality services, which imply a very good preparation in the field. The trust inspired by the travel agent to the client and the previous experiences he had with other agencies is also of utmost significance. Beyond the theoretical parts travel manuals offer, travel agency-tourist has to be seen as a relationship of trust between those who provide travel services and the recipients. Online travel packages purchasing registered a very significant growth, tourism tending to become virtually biggest industry on the internet. With this in mind, we found it necessary to treat the accounts of travel companies in Romania, which are not prepared to make a financial effort to make their online advertising the main way to promote. The central role of agencies will maintain or decrease depending on several variables: the relationships between companies, consumer habits, laws which protect the consumer, the relationship between the various tourist services etc.

Keywords: accounting, tourism product, tourism services, prepayments, discount, travel expense

JEL Classification: M2, M4

1. Introduction

Tourism, as an economic activity, must connect to the concept of sustainable development, being an industry that is dependent on natural resources and the cultural heritage of each companies that sell these resources (processed or not) as part of the "products" and at the same time, shares some resources with other users, including local communities.

The success-life of a travel agency depends on how it manages to develop tourist products to satisfy at a greater extent the needs of different customer segments, to differentiate from the competition.

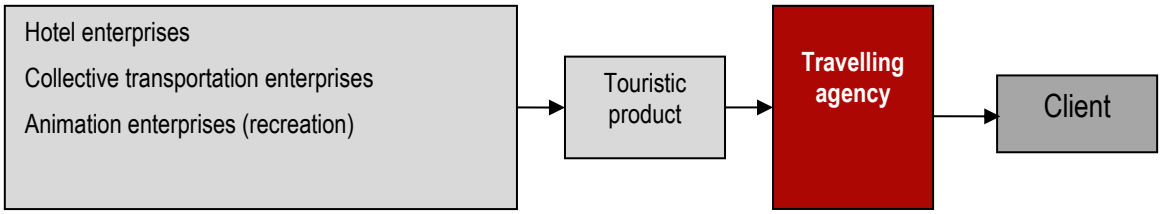
The central role of agencies will maintain or decrease depending on several variables: the relationships between companies, consumer habits, laws which protect the consumer, the relationship between the various tourist services etc.

A travel agency is a company with limited resources that can achieve significant economic effects, but it depends on how it is managed and it's professionalism but also how it operates in all company departments. A multiple specialization of the employee provides company functionality with good results, without the need for a bushy and therefore expensive organizational chart.

2. Accounting treatment

The complexity of the tourism market is a result of the fact that it contains a unique tourism product, consisting of goods and services, of tangible and intangible elements. As tangible elements of the tourism product can include: hotel, restaurant, transportation, food and drinks, craft, game rooms etc. As intangible elements of tourism product can include: atmosphere and ambience, catering methods, leisure or entertainment. (Scrioşteanu, Mitrache 2012, 8)

Schematic stages through which the tourists services, in the tourism assembly, until reaching the tourist product and then until reaching its final consumer, are:



Source: Cosmescu Ion -"Tourism – complex economic and social phenomena, pp. 34-36

***Figure 1** - The participants at developing the touristic product*

Clearly tourism product does not fully resemble another, even if it has the same ingredients, purpose and participants. This just makes it so interesting activity of travel agencies.

In Romania, the travel package, as defined by Government Ordinance no. 107/1999, is the combination of not fewer than two of the following three groups of services, provided the period of more than 24 hours or including an overnight stay, namely:

- transport;
- accommodation;
- other services not related to transportation or accommodation or not their accessories, which are a significant part of the package holiday, such as food, spas, entertainment and the like.

According to Art. 10 of Law no. 82/1990, responsibility for the accounting organization and management in companies is dedicated to the administrator, who is bond with the unit's management. Accounting is organized and usually leads in separate compartments, led by CFO, chief accounting officer or another person authorized to perform this function. These individuals must have higher economic education.

Accounting can be organized and managed on contracts for the provision of services in accounting, completed with individuals authorized by law, members of the Body of Expert and Licensed Accountants of Romania.

Organizing the financial - accounting department involves:

- Establishing the department's organizational plan, respectively the number of people required and the appointment of a head of department as appropriate;
- Development of procedure manuals for the whole circuit of the entity's accounting and financial documents and determining accountability of every person in this circuit, thus achieving financial department connection with all other departments within the entity;
- Depending on the complexity of the entity, there shall be established an informatics system for accounting activity.

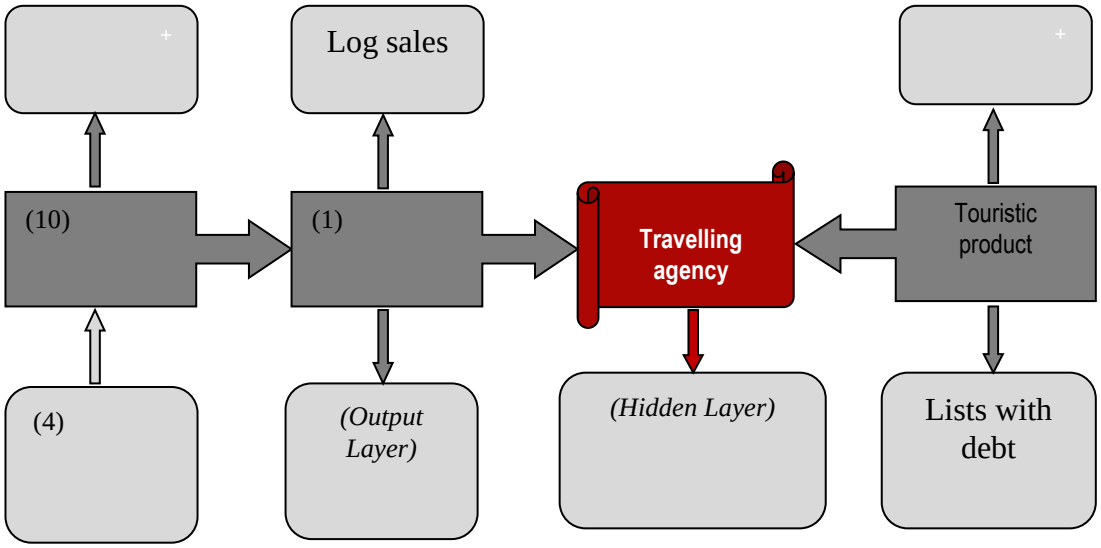
In our days, due to the evolution of information technologies, all process of accounting is done by using specialized software.

In a travel agency, work begins with a command from the client, the agency provides the required services prices, tourists are drawn a contract, partial receipts are done, which may be in different currencies, advance bills are done, after "final payment" there are invoiced holidays and the reversal of any advances.

Invoices are noted, of course, in sales journals, according to the Articles of VAT rates on them. Amounts on them are not, however, "accrued income", but are noted in credit account 462 "Sundry creditors".

Over time, they receive invoices from vendors, occasion when you may get to know the fact and the exact amount of the agency's "commission". These bills are passed in the Journal of purchases, according to VAT rates. The amounts do not represent "Prepayments" (Account 471), but are still registered through "Sundry creditors".

Later, when all the bills for an "action" are received, a "discount" is made, which aims to determine which the agency profit in each action was. The balance sheet consists of all invoices issued and all invoices received. The difference between them is the agency commission, analytically distinct 704 "Incomes from provision of services", which collect VAT (for cases where no invoice was collected, example - discount to the EU foreign tourism)



Source: http://servicementor.ro/agenţii-de-turism.html

Figure 2 - *Work-flow in a travel company*

So it is obvious that there will be equality between the discount of travels and the journals of purchases and sales because journals appear in invoices to which the date of their issue, while in the discount, occur when they closed the case. The discount is usually for each type of operation in part: discount for domestic tourism, ticketing, etc.

Software "for travel agents" on the market do return each "command" or "action", they are grouped by operators, but not grouped by type of operation, as required for accounting.

The discounts are kept in the archives of the company, as they are the primary accounting documents (determine income, expenses, so implicitly, profit) and tax (for certain classes of shares, based on the bill, the collected VAT on agency fees).

The flow of accounting documents in a travel agency has the following transactions and documents in concern:

1. Transactions made during booking and marketing of a tourism product are:
   - Initial phase, the customer is issued a purchase order;
   - Then the travel agency deals with making reservations, contacting all partners involved, purchasing tickets, insurance, etc.;
   - Tourists can make prepayments for receiving invoices and receipts in advance;
   - The contract is drawn up;
   - Finally, after the customer has paid in full, the customer shall draw up a final invoice, voucher or ticket rest-treatment and so on; all documents (tickets, vouchers, invoices, contracts, insurance, etc.) are given to the customer.

2. Invoices issued are drawn up so as to properly handle special VAT regimes, for the unique package of services, with the necessary differentiations: services in Romania, in the EU, outside the EU, visa and taxes, transport (airplane tickets…) internal, external, treatment services, meals, individual client versus legal client etc. Note that the same kind may be present items with different VAT cases.

3. Documents written not accounted on income and deferred in advance, but by account 462 "Sundry creditors". These are broken down analytically, for distinctive cases, existing in the society.

4. The partner's trade management is realized, each obligation document (invoice) or sheet (orders, receipt, compensation, etc.) are treated separately. You can charge in euro bills issued in lei and vice versa; where that is the case, we calculate foreign exchange differences in detailed or condensed reports on customers and suppliers, account sheets etc.

5. Each of the discounts made by the travel agent (discount for foreign plane tickets, discounts for domestic accommodation, for EU and non-EU accommodation, etc.) are recorded in the accounting program through various accounting notes, noting advance incomes over the incomes,

prepaid expenses being noted in expenses, and therefore checking by income the agency's commission, as well as collecting VAT on it, if appropriate.

Note that the purchasing of online packages has recorded a very important increase, tourism tending to become virtually the biggest industry on the Internet.

Accounting for the invoice issued to the customer:

4111	=	462	1200 Lei
Clients		Analytic *Sundry creditors*	The amount of the ticket or treatment *(provision itself plus agency fees)*

When you receive the invoice from the provider of tourist packages, recorded are:

:

462	401	1000 Lei
Analytic *Sundry creditors*	*Suppliers*	The actual value of the services

462 sundry creditor account determines the value of the agency's commission: 1200-1000 = 200 Lei

Closing the touristic discount statement:

:

462	704	161,29 Lei
Sundry creditors	*Revenue from services provided*	The amount of the commission applied

:

462	4427	38,71 Lei
Sundry creditors	*VAT collected*	TVA related to the commission

I would like to emphasize that in a month there are cases, more than likely, you cannot close the return of tourism services is billed as the customer to collect the money, but do not receive the invoice from the vendor related, and vice versa. In this case, of course, amounts remaining in the account are 462x debit or credit, depending on the situation. For this reason this account must be treated carefully, and at the end of each month shall draw up a situation that returns were not closed for the next month to be closed, and if you do not close next month will make their closing and so on.

Only those with experience in tourism can make such remarks, because most of those who do not practice accounting in a travel agency recommended accounting monographs as in the example below, the full amount of the invoice is recorded as revenue of the Agency which will artificially high turnover, therefore implicit income tax payable quarterly by the Agency until the 25th of the month following the quarter for which the tax is calculated.

Accounting records:

- Recording costumer invoice:

4111	472	1200 Lei
Clients	*Incomes recorded in advance*	

- Recording the invoice received from the supplier:

471	401	1,000 Lei
Expenses recorded in advance	*Suppliers*	

- At the end of September we close the touristic discount:

472 *Incomes registered in advance*	%	1,200.00 Lei
	704 Analytic (value equal with the corresponding amount *Revenue from services rendered* from account 628)	1,000.00 ron
	704 Analytic to the commission *Revenue from services rendered*	161.29 Lei (200-38,71)
	4427 Analytic VAT to the commission *VAT colected*	38.71 Lei
628 Analytic *Other service related expenses done by third parties*	471 (suppliers invoice) *Expenses registered in advance*	1,000.00 Lei

Conclusion

A good accounting instrumentation of the activity of a travel agency means efficiency both in terms of business activity, but also by reducing the risk of fines which may be subject to firm as a result of law enforcement for non-compliance tax accounting treatment required by legislation.

Starting from the idea that the accounting information has a basic role in decision making in the management of tourism companies, we sought to gather out in this paper basic notions and concepts of accounting, working methods and techniques, both theoretically and in terms of practical applicability in tourism.

Treating tourism services only from an accounting perspective could not have be understood if it had not been addressed and exposed with notions related to the concept of tourism, the legislative framework in which it develops, if a short classification of enterprises tourism had not been done - the case of the agencies - the main link in the marketing of the tourism product.

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IMPROVING COMPETITIVENESS AND TRADE BALANCE OF GREEK ECONOMY: A COOPETITIVE STRATEGY MODEL

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Abstract:

In this work, we propose a coopetitive model applied to the Greek crisis, aimed both at improving the competitiveness of the Greek productive system and rebalancing the current account balance of the country.

Our model of coopetition (based on normal form game theory) is conceived at a macro level, wherein there are two players: Greece and SNC (the Surplus Northern Countries of the euro area). We suggest a model that looks for a win-win solution. The win-win solution entails a cooperative bi-strategy in which SNC should contribute to re-balance its trade surplus with respect to Greece and, in addition, SNC should provide a certain amount of foreign direct investment (FDI) to improve the competitiveness and the growth in Greece. Thus we find a transferable utility and properly coopetitive solution, convenient for all the players.

Keywords: Games and economics; coopetition, cooperation, competitiveness; trade balance; foreign direct investment; Greek economy.

JEL Classification: C71, C72, C78, F2, F23, F42, O24

1. Introduction

How can we help Greece to find solutions to overcome or, at least, improve its economy, which is still suffering from a deep crisis since 2010? Which policy actions can be taken within the euro system to make the Greek economy more competitive and steer the country towards a path of sustainable economic growth? The austerity measures imposed by the European authorities and the IMF to Greece revealed their limits, determining a long and deep recession and making the recovery very problematic, as Mussa (2010) had already foreseen. In this work we devise a coopetitive model aimed both at rebalancing the current account balance of Greece and make its productive system more competitive. So, we propose a model that looks for a win-win solution. This model, based on normal form game theory and conceived at a macro level, aims at suggesting feasible solutions in a coopetitive perspective for the divergent interests, which drive the economic policies of the countries in the euro area.

In the model we consider only two players: Greece and the Northern Countries of the euro area in surplus (*SNC*), namely: Germany, Austria, France, Finland, Netherlands and Luxembourg. In fact, since 2008, these latter countries have become much more competitive than the Southern countries of the euro area (Greece, Portugal, Spain and Italy), thus these Northern countries have obtained large current account surpluses. In our model the win-win solution entails that *SNC* should contribute to re-balance its trade surplus with respect to Greece.

In addition, *SNC* should provide a certain amount of foreign direct investment (FDI) that can improve the competitiveness of Greek economy, FDI may also become an important part of a new strategy of growth in Greece because of its spillover effects. This economic policy strategy based on coopetition pursued by *SNC* and Greece is convenient for both since it will help to make the euro area a financially stable region; in addition the improved competitiveness of Greece will favor its growth and this will benefit *SNC* as well. We are indeed aware that this model is built on some special assumptions, though not unrealistic, so our analytical framework of coopetition represents a partial and possible way out of the economic crisis that hits the Greek economy.

2. Greece, its crisis and the strategy based on coopetition

Greece is still suffering a deep and lasting economic crisis. The rates of changes of its real GDP in the last three years, 2011, 2012, 2013, have been heavily negative, respectively -7.1%, -6.4 per cent, - 4.2 per cent (Eurostat, 2013). All this demonstrates that the austerity policies imposed by the European authorities and the IMF have produced a severe and lasting downturn in the economy

(Cline, 2013). So the only desiderable and correct solution for Greece is to favor its growth (De Grauwe, 2013, Schilirò, 2012, 2013). Carfì and Schilirò have already suggested a strategy based on coopetition to find feasible solutions to overcome the Greek crisis (Carfì, Schilirò, 2011). In the present model, like in other coopetitive models we already developed (Carfì, Schilirò, 2011, 2012, 2013), we provide a coopetitive win-win solution, a situation in which each agent (the Greece, on one side, and the *SNC*, on the other) cooperate and compete at the same time, taking into account the divergent interests of the two sides, and in which both sides gain. In this paper, more specifically, we propose a new coopetitive model where the coopetitive (shared) variables are the exports of goods and services from Greece to countries of the euro area in surplus (*SNC*) and the FDI from *SNC* to Greece. Regarding the exports of Greece towards *SNC*, this strategy can alleviate the trade deficit of the Greek economy. As far as the latter variable (FDI), Greece, by receiving inward investment, will improve its competitiveness and gains in terms of an increase in productive capacity, determined by a shift in the aggregate supply. The Greek economy will also experience an increase in the aggregate demand, with a greater production and the creation of new jobs. A very important effect of FDI is that home producers in Greece will have access to the latest technology from abroad with positive externalities on the production system; moreover there will be a positive effect on the country's capital account, since FDI represents an inflow (credit) on the capital account. Finally, there will be less need to import because goods are produced in the domestic economy. All this will concur to affect positively the competitiveness of the Greek economy, favoring the stability and growth in Greece and, in turn, benefiting the whole euro area. The present model is based on the notion of coopetition (Branderburger, Nalebuff, 1995, 1996; Bengtsson, Kock, 1999, 2000; Luo, 2007; Padula, Dagnino, 2007). It provides a game theory framework that offers a set of possible solutions in a coopetitive context allowing us to find bargaining Pareto solutions in a win-win scenario. We already devised a coopetitive model at a macroeconomic level in which we had developed a coopetitive game by excluding the mutual influence of the actions (or strategies) for the two players (Carfì, Schilirò, 2011). This choice has allowed us to greatly simplify the model; secondly it has highlighted the coopetitive aspect, although at the expense of the classical feature of game theory. Later we developed other models (Carfì, Schilirò, 2012, 2013) where we have taken into account of this mutual influence, as in the present model we are going to describe.

3. The coopetitive model

In this paper, we develop and apply the new mathematical model of a coopetitive game - introduced in Game Theory for the first time by David Carfì and already adopted by Carfì and Schilirò (2011, 2012, 2012a, 2013) in different contexts. The model introduced in this paper requires technics and competences adopted and pointed out in Carfì (2009), Carfi, Musolino (2011, 2012, 2012a, 2013, 2014) and Carfì, Ricciardello (2010, 2012, 2013) and, from a algorithmic point of view, in Agreste, Carfì, Ricciardello (2012), Carfì, Ricciardello (2010, 2012, 2013). Furthermore, we desire to notice that the Brandenburgher and Nalebuff's idea of coopetitive game is mainly used, in a mostly intuitive and non-formalized way, in Strategic Management Studies. Let us begin with our basic assumptions.

Assumption 1. Our first hypothesis is that *SNC* must stimulate the aggregate demand to re-balance their trade surplus in favor of Greece. Moreover, we assume that - in agreement with the Greek Government - they will invest in innovative and efficient technologies in Greece.

Assumption 2. The second hypothesis is that Greece, a country with a huge public debt, unsustainable to deficit/GDP and low productivity is forced by external authorities to undertake austerity measures and, since the country needs to get the equilibrium of its trade balance, it agrees to increase its exports primarily towards *SNC*.

Assumption 3. The coopetitive model we propose hereunder must be interpreted as a normative model, in the sense that:

- *it imposes some clear and a priori conditions to be respected, by binding contracts, in order to enlarge the possible outcomes of both countries;*
- *consequently, it shows appropriate win-win strategy solutions, chosen by considering both competitive and cooperative behaviors, simultaneously;*
- *finally, it proposes appropriate fair divisions of the win-win payoff solutions.*

Assumption 4. The strategy spaces of the model are:

- the strategy set of *SNC*, say *E*, set of all possible consumptions of *SNC* (in our model), given in a conventional monetary unit.
- the strategy set of Greece *F*, set of all possible reductions of public expenses of Greece (in our model), given in a conventional monetary unit (different from the above *SNC* monetary unit);
- a shared strategy set *C*, whose elements are determined together by the two players, *SNC* and Greece, when they determine their own respective strategy sets *E* and *F*. Every strategy *z* in *C* is a pair (z_1, z_2) of monetary amounts: the first component z_1 represents an amount - given in a third conventional monetary unit - of Greek exports imported into *SNC*, by respecting a binding contract; the second component z_2 represents the amount of investments of *SNC* in Greece, by respecting a binding ex-ante agreement.

Therefore, in the model, we assume that *SNC* and Greece define the set of coopetitive strategies.

3.1. Strategy spaces and payoff functions

Assumption 5. In this model, we consider a linear affine mutual interaction between *SNC* and Greece, adherent to the real state of the Euro-area. Specifically:

- we consider an interaction between the two players also at the level of their non-cooperative strategies;
- we assume that Greece also should import (by contract) some *SNC* production.

Assumption 6. We assume that:

- any real number *x*, belonging to the interval $E := [0,3]$, represents a possible consumption of *SNC* (given in an appropriate conventional monetary unit);
- any real number *y*, in the same interval $F := E$, represents aggregate austerity measures of Greece (given in another appropriate conventional monetary unit);
- any real number z_1, again in the interval $C_1 = [0,2]$, represents any possible amount of Greek exports which is imported by *SNC* (given in conventional monetary unit), by a binding ex ante agreement;
- any real number z_2, in the same interval $C_2 = [0,2]$, represents a possible investment of *SNC* (given in another appropriate conventional monetary unit).

3.1.1 Payoff function of Surplus Northern Countries of the euro area

We assume that the payoff function of *SNC*, f_1, is represented by its aggregate demand:

- f_1 is equal to the consumption function C_1 plus the investment function I_1 plus government spending (that we shall assume equal 2, constant in our interaction) plus export function X_1 minus the import function M_1, that is:

$$f_1 = 2 + C_1 + I_1 + X_1 - M_1.$$

We assume that:

- *SNC*'s consumption function C_1 is the first projection of the strategic coopetitive space $S := E^2 \times C$, *where* the space C is the Cartesian square $[0, 2]^2$) that is the function defined by: $C_1(x, y, z) = x$, for every possible *SNC* consumption *x* in *E*; this because we assumed *SNC*'s consumption to be the first strategic component of strategy profiles in *S*;
- the investment function I_1 is constant on the space *S*, and by translation we can suppose I_1 equal zero;
- the export function X_1 is defined by $X_1(x, y, z) = -y/3 - z_2/2$, for every Greek possible austerity measure *y* and for every *SNC* possible investment *y* in innovative technology in Greece; so we assume that the export function X_1 is a strictly decreasing function with respect to the individual Greek strategy and the second cooperative component strategy;
- the import function M_1 is the following partial projection of the strategic space, namely $M_1(x, y, z) = z_1$, for every cooperative strategy $z_1 \in 2\mathbf{U}$ (the notable space **U** is the unit interval [0,1]), because we assume the import function M_1 depending only upon the

cooperative strategy z_1 of the coopetitive game G, our third strategic component of the 4-dimensional strategy profiles in S.

Recap. We then assume as payoff function of *SNC* the aggregate demand f_1, which in our model is equal, at every triple (x, y, z) in the profile strategy set S, to the sum of the strategies $x, -z_1$ with the export function X_1, viewed as a *reaction function* to the Greece investments (so that f_1 is the difference of the first and third projection of the strategy profile space S plus the function export function X_1).

Concluding, the payoff function of *SNC* is the function f_1 of the set S into the real line $\mathbf{R}$, defined by: $f_1(x, y, z) = 2 + x - y/3 - z_1 - z_2/2$, for every triple (x, y, z) in the space S; where the reaction function X_1, defined from the space S into the real line $\mathbf{R}$ by: $X_1(x, y, z) = -y/3 - z_2/2$, for every possible investment y of Greece in the interval $3\mathbf{U}$, is the export function of *SNC* mapping the level y of Greece austerity measure and the level z_2 of *SNC* investment in Greece into the level $X_1(x, y, z)$ of *SNC* export.

3.1.2 Payoff function of Greece

We assume that the payoff function of Greece f_2 is again its aggregate demand: namely, consumption C_2 plus investment I_2 plus government spending (assumed to be 1) plus exports X_2 minus imports M_2); so that:

$$f_2 = 1 + C_2 + I_2 + X_2 - M_2.$$

We assume that:

- the function C_2 is relevant in our analysis, since we assume the Greek consumptions depend on the choice of the strategy austerity measure y; we assume

  $$C_2(x, y, z) = 1 - y/3;$$

- the function $I_2 : S \to \mathbf{R}$ is defined by

  $$I_2(x, y, z) = z_2 + n\, z_1, \text{ for every } (x, y, z) \text{ in } S;$$

- the export function X_2 is the linear function defined by

  $$X_2(x, y, z) = z_1 + m\, z_2, \text{ for every } (x, y, z) \text{ in } S \text{ (see above for the justification);}$$

- the function M_2 is relevant in our analysis, since we assume the import function, by coopetitive contract with *SNC*, dependent on the choice of the triple (x, y, z) in S, specifically, we assume the import function M_2 defined on the space S by $M_2(x, y, z) = -2x/3$, so, Greece too, must import some *SNC* product, with value $-2x/3$ for each possible *SNC* consumption x.

So, the payoff function of Greece is the linear function f_2 of the space S into the real line $\mathbf{R}$, defined by:

$f_2(x, y, z) = 2 - y/3 - 2x/3 + (1 + m)\, z_2 + (1 + n)\, z_1$, for every triple (x, y, z) in the strategic Cartesian space S.

We note that the function f_2 depends significantly upon the strategies x in E, chosen by *SNC*, and that f_2 is again a linear function.

*Assumption***.** We shall assume, for our specific study, the factors m and n non-negative and equal respectively (only for sake of simplicity) to 1 and 1/2.

3.1.3 Payoff function of the game

We so have build up a coopetitive gain game with payoff function $f : S \to \mathbf{R}^2$, given by
$f(x, y, z) = (2 + x - y/3 - z_1 - z_2/2,\ 2 - y/3 - 2x/3 + (1 + m)\, z_2 + (1+n)\, z_1) =$

$= (2, 2) + (x - y/3, -2x/3 - y/3) + z_1(-1, 1 + n) + z_2(-1/2, 1 + m)$,

for every (x, y, z) in $S = [0, 3]^2 \times [0, 2]^2$.

4. Study of the game $G = (f, >)$

Note that, fixed a cooperative strategy z in $(2\mathbf{U})^2$, the section-game $G(z) = (p(z), >)$ - with payoff function $p(z) : E^2 \to \mathbf{R}^2$ defined on the square E^2 by:

$p(z)(x, y) := f(x, y, z)$,

for every bi-strategy (x, y) - is the translation of the game $G(0,0)$ by the "cooperative" vector

$v(z) = z_1(-1, 1 + n) + z_2(-1/2, 1 + m)$,

so that, we may study the initial game $G(0,0)$ and then we can translate the whole information of the game $G(0,0)$, by the vectors $v(z)$, to obtain the corresponding information for the game $G(z)$ (each game $G(z)$ is isometric to the initial game $G(0,0)$).

4.1. Study of the initial game G(0,0)

So, let us consider the initial game $G(0,0)$. The strategy square E^2 of $G(0,0)$ has vertices 0_2, $3e_1$, 3_2 and $3e_2$, where 0_2 is the origin of the Cartesian plane $\mathbf{R}^2$, e_1 is the first canonical vector (1,0), 3_2 is the vectors (3, 3) and e_2 is the second canonical vector (0, 1).

4.1.1 Topological Boundary of the payoff space of G(0,0)

In order to determine the payoff space of the affine game $G(0,0)$ it suffices to transform the four vertices of the strategy square (the game is an affine invertible game), because the critical zone is empty.

4.1.2 Payoff space of the game G(0,0)

So, the payoff space of the game $G(0, 0) = (g, >)$, where the function g is the section $f((\cdot, \cdot), (0, 0))$ is the parallelogram with vertices $g(0, 0) = (2, 2)$, $g(3, 0) = (5, 0)$, $g(3, 3) = (4, -1)$ and $f(0, 3) = (1, 1)$. As we show in Figure 1.

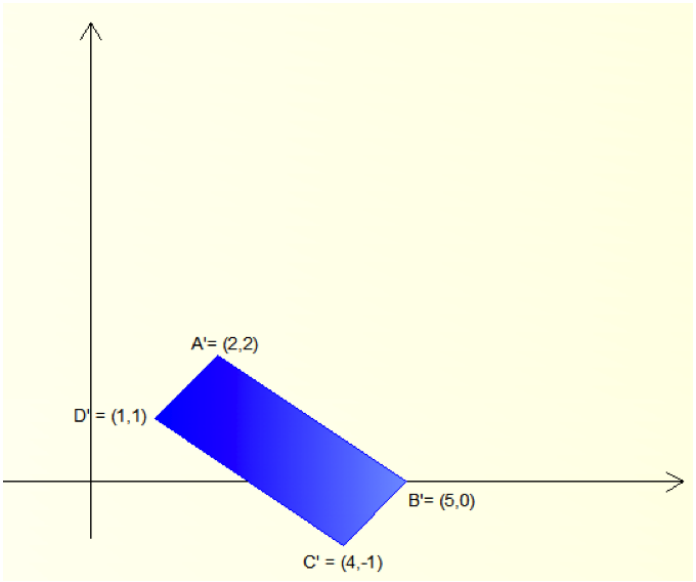

Figure 1: *Initial payoff space of the game (f, <).*

4.1.3 Nash equilibria

The unique Nash equilibrium of the initial game is the bi-strategy (3, 0). Indeed, the function g_1 is linear and increasing with respect to the first argument; analogously, the function g_2 is linear and decreasing with respect to the second argument.

4.2. Study of the entire coopetitive game G = (f, >)

4.2.1 The payoff space of the coopetitive game G

The image of the payoff function *f*, is the union of the family of payoff spaces $(\mathrm{im}(p_z))_{z \in C} = (p_z(E \times F))_{z \in C}$, that is the convex envelope of the union of the initial payoff $p_0(E^2)$ and of its translation by the vectors $v(2, 0)$ and $v(0, 2)$. The image of the coopetitive payoff function *f* , that is the payoff space of the game, is the convex envelope of the points $g(0,0)$, $g(3,0)$, $g(3,3)$, $g(0,3)$ and of their translations by $v(2, 2)$, as we show in Figure 2 (first step) and in Figure 3 (second step).

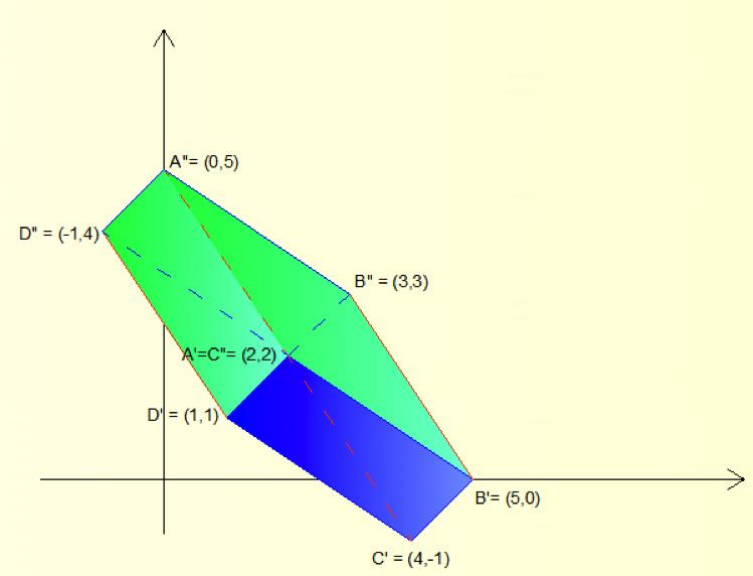

Figure 2: First dilation of the initial payoff space of the game (*f*, <).

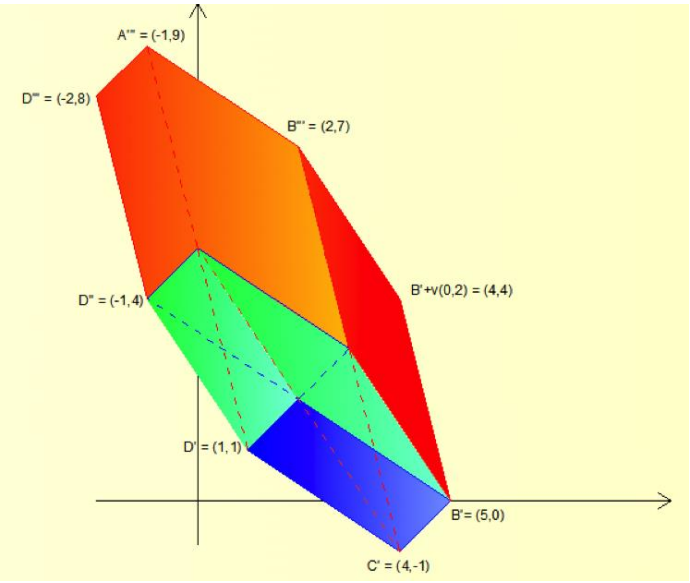

Figure 3: *Payoff space of the game (f, <), with m = 1, n = 1/2.*

4.2.2 Pareto maximal boundary of the payoff space of G

The Pareto sup-boundary of the coopetitive payoff space $f(S)$ is the union of the segments $[A''', B''']$, $[B''', (4, 4)]$ and $[(4, 4), B']$, see Figure 3.

4.3. Possibility of global growth

It is important to note that the absolute slopes of the segments $[B', (4, 4)]$, $[(4, 4), B''']$, of the Pareto (coopetitive) boundary, are strictly greater than 1. Thus the collective payoff $f_1 + f_2$ of the game is not constant on the Pareto boundary and, therefore, the game implies the possibility of a transferable utility global growth.

4.4. Trivial bargaining solutions

The Nash bargaining solution on the entire payoff space, with respect to the infimum of the Pareto boundary and the Kalai-Smorodinsky bargaining solution, with respect to the infimum and the supremum of the Pareto boundary, are not acceptable for *SNC*: they are collectively (i.e., from a Transferable Utility point of view) better than the Nash payoff of the initial game G_0 - both solutions belong to the Pareto segment $[(4, 4), (2, 7)]$ - but they are disadvantageous for *SNC* (they suffers a loss, with respect to (5, 0)): these solutions could be thought as rebalancing solutions, but they are not realistically implementable.

4.5. Transferable utility solutions

In this coopetitive context it is more convenient to adopt a transferable utility solution, indeed: the point of maximum collective gain on the whole of the coopetitive payoff space is the point $B''' = (2,7)$.

4.5.1 Rebalancing win-win solution relative to maximum gain for Greece in G

Thus we propose a rebalancing win-win coopetitive solution relative to maximum gain for Greece in G, as it follows (in the case $m = 1$):

- we consider the portion s, of transferable utility Pareto boundary M: $= (2, 7) + \mathbf{R}(1, -1)$,
- obtained by intersecting M itself with the strip determined (spanned by convexifying) by the straight lines Re_1 and $A''' + \mathbf{R}\, e_1$, these are the straight lines of Nash gain for Greece in the initial game $G(0)$ and of maximum gain for Greece in G, respectively.
- we consider the Kalai-Smorodinsky segment s' with vertices $(-1, 0)$ - infimum of the Pareto boundary - and the supremum of the Pareto boundary.
- our best payoff rebalancing coopetitive compromise is the unique point K''' in the intersection of segments s and s'.

Figure 4 shows:

• the above Transferable Utility (TU) Kalai-Smorodinsky solution K'''

• the TU Kalai-Smorodinsky solution K'' with respect to the Nash zone.

• the TU Kalai-Smorodinsky solution K' with respect to the Nash extreme point (4,4).

• the TU Kalai-Smorodinsky solution K with respect to the initial Nash equilibrium (4, 4).

4.5.2 Win-win solution

The payoff TU Kalai-Smorodinsky solutions K represents a win-win solutions, with respect to the initial Nash gain B'. So that, as we said, also *SNC* can increases its initial gain from coopetition.

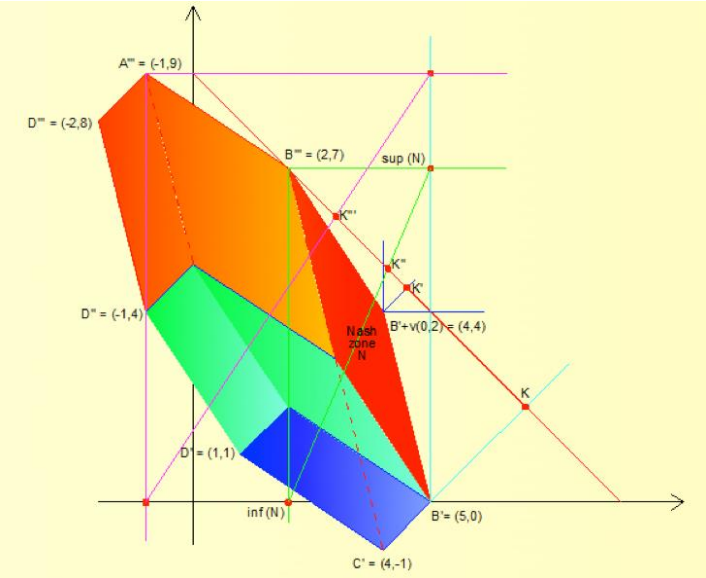

Figure 4: Kalai win-win solutions of the game (*f*, <).

4.5.3 Win-win strategy procedure

The win-win payoff *K* can be obtained in a properly transferable utility coopetitive fashion, as it follows:

- the two players agree on the cooperative strategy (2,2) of the common set *C*;
- the two players implement their respective Nash strategies in the game *G*(2,2), so competing a la Nash; the unique Nash equilibrium of the game *G*(2,2) is the bi-strategy (3,3);
- finally, they share the "social pie" $(f_1 + f_2)(3, 3, 2, 2)$, in a transferable utility cooperative fashion (by binding contract) according to the decomposition *K*.

Conclusion

From our model we can draw some concluding remarks. First, the coopetitive game, provided in our contribution, is essentially a normative model. Second, our example of coopetition has pointed out a win-win strategy, in a transferable utility and properly coopetitive perspective, for Greece and *SNC*. Third, we propose a framework characterized by a cooperative bi-strategy based on two shared variables: export from Greece to *SNC* and FDI from SNC to Greece.

Thus, in our model we provide:

- properly coopetitive solutions (not convenient for *SNC*): Kalai-Smorodinsky bargaining solution on the coopetitive Nash path, set of all possible Nash equilibria of the coopetitive interaction.
- one transferable utility and properly coopetitive solution, convenient also for *SNC* and also rebalancing for the Euro area.
- an extended Kalai-Smorodinsky method, appropriate to determine rebalancing partitions on the transferable utility Pareto boundary of the coopetitive game.

Finally, the solutions offered in our coopetitive model aim at enlarging the "pie" and sharing it fairly.

In addition, they show win-win and rebalancing outcomes, for the two countries, within a coopetitive game path. These solutions allow us to find "fair" amounts of Greek exports which *SNC* must cooperatively import, as well as the optimal amount of FDI that is necessary to improve the Greek economy, contributing to the growth and to the stability of both the Greek and *SNC* economies.

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APPLICATION OF MULTIPLE CRITERIA METHOD OF ANALYTIC HIERARCHY PROCESS AND SENSITIVITY ANALYSIS IN FINANCIAL SERVICES IN THE CZECH REPUBLIC

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Abstract:

The paper presents multiple criteria decision making, namely analytic hierarchy process, application of criteria weights sensitivity analysis, eliciting change of the order of variants. Assessments are focused on financial products (total 132 of financial leasing and loans alternatives) using four financial and four non-financial criteria. The aim of this paper is to consider a set of alternatives of financial products (financial leasing and bank loan) by the method of AHP and a weighted sum followed by selection of the optimal alternative and implement a sensitivity analysis. By applying these methods, it was found that the most appropriate type of financing is bank loan borrowed with a maximum amount equal to the market price. Sensitivity analysis showed that the most sensitive criteria have the smallest degree of significance.

Keywords: analytic hierarchy process, Saaty´s method, sensitivity analysis, financial products.

JEL Classification: C44, G30

1. Introduction

One of the key business activities are investment decisions, which focuses primarily on the renovation and expansion of the property (Fotr, Souček, 2011). Since the most costly alternative of financing are own resources, more businesses use the possibility of financing through external sources. The most common forms of procurement are bank loans and finance leases. At first glance, it is not possible to determine which of these products is clearly preferable. At present, although there are many lease and loan calculators, through which it is possible to compare different variants as leasing and credit. Such a comparison takes into account the non-financial (cash) criteria. It does not take into account such factors as the ownership of the object of acquisition, method and intensity of reporting, the distance between providers and users. To address these shortcomings multiple criteria decision-making methods can be used. The actual decision maker (or a group of decision makers) may define the key (critical) the criteria to be considered in this decision (Šoltés, Gavurová, 2013). The aim of this paper is to consider a set of variants of two types of financial products (financial leasing and bank loan) by the method of analytic hierarchy process (AHP) based on pair-wise comparisons (Saaty, Thomas, 1977) with the objective to select the best alternative and implement a sensitivity analysis. The paper is structured into two main parts. The first part deals the description of the applied methods. The content of the second part is an application of this method in assessing different alternatives of financial leasing and loan according to established criteria.

2. Methodology of analytic hierarchy process and sensitivity analysis

AHP method is based on Saaty's pair-wise comparison method, a structured technique designed to solve complex decisions (Saaty, Thomas, 1980), (Gironimo *et al*., 2013), (Deng *et al*,. 2014). This method is based on mathematical techniques and human psychology (Mazurek, 2012). In general the application of the method of AHP can be divided into three steps. First, create a hierarchical structure of the decision problem; see (Deng *et al*, 2014). Basic decomposition hierarchy consists of three levels namely: the objective, criteria and alternatives (Saaty, 2001), (Saaty and Peniwati, 2008). Subsequently comparison matrix is compiled using pair wise assessment in which the criteria will be compared with each other in order to assess their level of interest (i.e. determination of weights of individual criteria) as 9 - point scale for preferred criteria (see Table 1) for non-preferred terms are used reciprocal value of the scale. The third step is to assess alternatives against each other in terms of individual criteria (according to the 9 - point scale).

Criteria normalization and significance

Criteria are the terms (factors), under which options go under consideration, they are labelled f_j. Criteria can be classified according to the nature (maximization and minimization) by quantification (quantitative and qualitative). Quantitative criteria can be arranged in the criterion matrix. In the application part of the paper quantitative criteria have minimization as well as maximization character (Fiala *et al*,. 1997)

When solving problems using the methods of multiple criteria evaluation of the criterion evaluation matrix X must consist of finite number of alternatives; respectively pair wise comparison matrix. This matrix is a square, where x_{ij} expresses rating i^{th} the variant j^{th} criterion, the vector of weights w (where w_j is the normalized weight of the jth criterion). In that matrix X columns correspond to the criteria (f_1 to f_m) lines and the alternatives (A_1 to A_n).

In the method of AHP the criteria are standardized separately (again according to Saaty scale see Table 1). The starting point for the construction of preferences (weights) is considered using the method of AHP, the construction of pair wise comparison matrices, which is square of order. Element of the array is the size of the expressed preference of the i^{th} criteria with respect to the j^{th} criterion. For evaluating pairs nine-point scale is used, see Table 1 of the elements of the diagonal matrix relation that holds $s_{ii} = 1$ (each criterion is itself equivalent). It is a reciprocal matrix, i.e. that the elements of the matrix have inverse relationship a follows: $s_{ji} = \frac{1}{s_{ij}},\ i, j = 1,...,m.$

Table 1 - Saaty scale

Scale	Description
1	Criteria *i* and *j* are equal
3	Low preference of criteria *i* before *j*
5	Strong preference of criteria *i* before *j*
7	Very strong preference of criteria *i* before *j*
9	Absolute preference of criteria *i* before *j*
2, 4, 6, 8	Medium values between two neighbouring criteria for more precise preference determination.

Source: (Ramík, 1999), (Saaty, Thomas, 1980)

The elements of pair wise matrix are in general not perfectly consistent. In reality, there is the decision maker unable to enter the matrix elements so that they are fully consistent, because they may commit errors in decision-making in the form of subjectivity that can produce various noises (e.g. vague understanding). Consequently, it is not always true that $s_{ij} = s_{ih} \cdot s_{hj}, h, i, j = 1,...,m.$

This condition is relevant to Saaty matrix. It is assessed according to the variable consistency CR (consistency ratio), the value for minimal consistency should be no higher than 10% (i.e. 0.1):

$$CR = \frac{CI}{RI} = \frac{\frac{\lambda_{max} - m}{m-1}}{RI}, \qquad (2.1)$$

where C.I. is the index of consistency (consistency index), λ_{max} is the largest eigenvalue of the matrix, which can be calculated as follows:

$$\lambda_{max} = \frac{1}{m}\sum_{j=1}^{m}\frac{(\mathbf{S}\cdot\mathbf{w})_j}{w_j}, \qquad (2.2)$$

where m is the number of criteria, *RI* is a random index for the average value for different number of criteria (CR is calculated for the minimum range = 3 *m*, for *m* = 1 and 2 will automatically assume the consistency of the matrix), the values are shown in Table. 2, *w* is a vector of normalized weights, see (Alonso and Lamata, 2006). Estimated weights v_j is the geometric mean of the line

$$v_j = \left[\prod_{j=1}^{m} s_{ij}\right]^{\frac{1}{m}}. \qquad (2.3)$$

Table 2 - Random index

m	3	4	5	6	7	8	9	10	11	12	13	14	15
RI	0,58	0,90	1,12	1,24	1,32	1,41	1,45	1,49	1,51	1,54	1,56	1,57	1,58

Source: according to (Donegan, Dodd, 1991)

Row Geometric Mean Method of Weight Estimation and Weighted Sum Approach.

The geometric mean line (representing a more standards-value criterion), which is then adjusted to a standard value as the value of one share of non-standardized criteria and the sum of all non-standardized values: T for the final decision j for selecting the optimal alternative respectively. To assess alternatives an aggregated criterion is designed, which may take the form of multiple criteria utility function (score), compromise criterion (target programming based on minimum distance), aggregate (fuzzy) preferential session and more. In this article we will work with virtually most commonly used option for calculation of utility function, which is the weighted sum method (WSA - Weighted Sum Approach) where the aggregate criterion is calculated according to:

$$U(a_i) = \frac{\sum_{j=1}^{m} x_{i,j} \cdot v_j}{\sum_{j=1}^{m} v_j}, \qquad (2.4)$$

where: v_j is the weight of the j^{th} criterion, Σ of v_j is the sum of all (non-standardized) weights of criteria, expressed x_{ij} (standard) evaluation of the i^{th} variant according to the j^{th} criterion. It is also possible to work with standardized weights, which can be obtained following adaptation:

$$w_j = \frac{v_j}{\sum_{j=1}^{m} v_j}, \qquad (2.5)$$

All variations are possible on the basis of the weighted sum of the order by different perspectives (e.g., from the best to the worst case scenario). It is important to know whether this ranking is stable, i.e. it means that order of alternatives is sensitive to changes in weights. To determine the stability, the sensitivity analysis of the alternatives to changes in the values of weights has to be performed.

Sensitivity analysis

Bearing in mind the above information (on the order of individual alternatives) constructed for the sum of the weights (2.4), sensitivity analysis will be carried out according to the assessment of the alternatives weights for this criterion.

The sensitivity analysis proceeds as follows. Considering alternatives, covered by U (m)> U (n). For these alternatives the limit value is sought, which is increased by the scale, and changes the order U '(m) <U' (n). If substitution is introduced after adjustments the following basic rules for determining the sensitivity limits of the instrument, see more (Zmeškal *et al.*, 2013), (Zmeškal,2009), (Chalúpková, Kresta, 2013), (Wedley, William *et al.*, 2001).

$$\alpha_k^{m,n} > \frac{A_m - A_n}{x_{n,k} - x_{m,k}}, \text{ for } x_{n,k} - x_{m,k} > 0, \qquad (2.6)$$

In Eq. (2.6) and (2.7), the more coefficients are smaller the more sensitive the ranking is to variations of the weight. The last Eq. (2.8) presents a situation in which alternatives are based on their equivalent weights. The variants are insensitive to changes in weights. Thus, it is possible to create a table of weights changes (limits, thresholds), leading to reordering of variants. It is possible to assess not only the selection of variants with respect to the best option, but also other variants of each other. New weighting of the criteria that will trigger a change in the order of variants can be obtained according to the equation (Chalúpková, Kresta, 2013):

$$w_j' = \begin{cases} \dfrac{v_j + \alpha_k^{m,n}}{\sum_{j=1}^{m} v_j + \alpha_k^{m,n}} \; for \; j = k \\ \dfrac{v_j}{\sum_{j=1}^{m} v_j + \alpha_k^{m,n}} \; for \; j \neq k \end{cases}, \tag{2.9}$$

3. Application of the analytical hierarchical decomposition method process

The content of this chapter is the practical application of AHP method, based on the Saaty method of pair-wise comparisons of finance leases and bank loans. Similar approach can be found in Chalúpková and Jiří, 2013), (Roháčová, Marková, 2009). The goal will be prioritization of alternatives as selecting the most appropriate method of financing assets by the method of weighted sum and implemented sensitivity analysis to find the best solution.

The aim of this chapter is, from the perspective of the decision maker on the basis of specified criteria (factors, parameters), consider a set of alternatives (proposals), then choose the most appropriate means of the methods described above following Eq. (2.1) to (2.5) and implement a sensitivity analysis of the solution.

Structure and characteristics of the decision problem, including the applied methods are reported in Table 3.

Table 3 - Problem definition and description

Part of the problem	Description
Decision making problem	Assessment of financial products to acquire property.
Decision maker	Entrepreneur
Goal	Selection of the most appropriate source of financing assets.
Criteria function (utility function)	Finding the optimal alternative using a weighted sum method.
Alternatives	Various financial products
Entry data normalization	Pair-wise comparison using Saaty method
Criteria	Relevant factors for comparison.
Weight estimation method	Row Geometric Mean Method of weight estimation from Saaty matrix.

Source: own elaboration

Given the fact that the decision-maker shall have 132 options to mutual consideration is appropriate to divide them into smaller groups (depending on the provider and the period of repayment), which will be implemented and then pair-wise comparison of each group will be selected as options with the highest values of the sum of criteria according to Eq. (2.4). Maximum number of selected variants (the second step of the pair-wise comparison) will be equal to number fifteen, because *RI* (Random Index) is defined as the maximum number of $m = 15$.

Decision problem can be represented using a hierarchical structure, as seen in Figure 1.

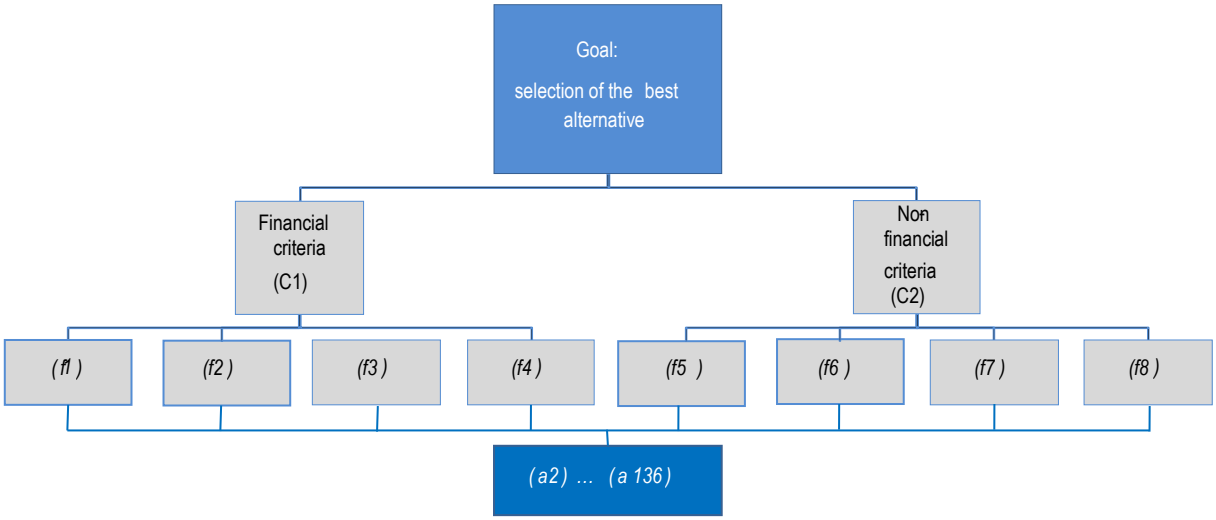

Figure 1 Hierarchical structure of the decision making problem

Criteria description

Analyzed variants are considered from the perspective of a group of financial criteria (C_1) and from the perspective of a group of non-financial criteria (C_2). A group of financial criteria are factors f_1 to f_4.

Total amount (f_1) equals the cost of the car minus the amount of extra payments, respectively principal amount of the loan or deferred sale. Total amount is due to the fact that the decision maker wants to use it for the acquisition with minimum of its own resources, it aims to maximize the amount i.e. maximization criterion. Annuity (f_2) i.e. monthly payment; decision maker requires that the value of the monthly payment is as low as regards the minimization criterion. Related fees (f_3) include charges pertaining to the acquisition of a financial product, for example processing fee or account administration fee. Decision-maker requests that the criterion value is as low as regards the minimization criterion. Reimbursement (f_4) represents the cost of debt, which is in addition to the principal and related charges client is obligated to pay for the use of foreign sources of funding, also to the minimization of the criterion.

The second group is non-financial criteria that are identified as factors f_5 to f_8. These criteria are not taken into account e.g.: leasing or loan rate, the internal rate of return method, the net present value, etc. Ownership of the financial product (f_5) - under the current legislative amendment Czech Republic applies to the procurement of assets under finance leases are subject landlord owner - the leasing company i.e. legal owner and not the actual user, but if loan financing is the owner of the acquired user object; to quantify the value of this criterion is used value : 0 - the user does not own the subject of acquisition i.e. it is not even in the balance sheet , 1 - the user 's own subject acquisition and recognized in the balance sheet. For some financial products it is usually included in the monthly payment as insurance and accident insurance. Therefore, it is the sixth assessed factor (f_6) insurance included in monthly instalments. To quantify this criterion value the values are : 0 - no advantage 1 - a financial product, 2 - two financial products included in the annuity, the client's desire to maximize this criterion , i.e. maximization criterion. The seventh criterion includes a number of documents required to obtain a financial product, the difficulty of recording financial product in client accounts as well as eligibility to meet the tax deductibility. To summarize, this criterion is known as the administrative cost of the financial product (f_7). The last criterion is the non-financial (f_8) distance from the office of the decision maker to nearest financial institution's branch. The effort is to minimize the last criteria, as they represent an additional burden for the client.

Having defined sets of criteria and the criteria themselves is necessary to determine their preferences. The finding of significance was used Saaty's pair-wise comparison method according to point scale in Table 1 All weights are determined by expert estimates. After determining the weights for the local groups are local as well as weights for the criteria necessary to establish a global weight for each criterion, see Table 4.

Table 4 – Local and global weights of criteria

Criteria	Local weights		Global weights	
Goal	AHP		AHP	
Financial criteria group	0,667	66,7%	0,667	66,7%
Non-financial criteria group	0,333	33,3 %	0,333	33,3 %
f_1 – Total amount	0,595	59,5 %	0,397	**39,7%**
f_2 - Annuity	0,158	15,8 %	0,106	**10,6 %**
f_3 – Related fees	0,080	8,0 %	0,054	**5,4 %**
f_4 –Reimbursement coefficient	0,166	16,6 %	0,110	**11,0 %**
f_5 – Asset ownership	0,656	65,6 %	0,219	**21,9 %**
f_6 – Inssurance within the annuity	0,163	16,3 %	0,054	**5,4 %**
f_7 – Administration of the financial product	0,093	9,3 %	0,031	**3,1 %**
f_8 – Distance from the office	0,089	8,9 %	0,030	**3,0 %**

Source: own elaboration.

An analysis of global weights implies that the decision maker prefers to borrow the full amount needed to finance a passenger car evidenced by the level of interest of this criterion, which amounts to 39.7%. Consequently, it is important for him to be the owner of the object or only user i.e., that is the criterion of property ownership constituted of 21.9%. Other important criteria are the rate of reimbursement, preferably 11% and the amount of monthly payment (annuity) with a significance level of 10.6%.

Description of selected alternatives

The second step of the pair-wise comparison was to select fifteen alternatives of financing. This set was created following the highest aggregate utility function of criteria (weight) and consists of two financial leasing and thirteen loans.

Selection of each is made by expert estimation based on Saaty recommended scale (Saaty, Thomas, 1980) for pair-wise comparison. Results of the partial calculations and the construction of standardized criteria values see Table 5.

Table 5 – Normalized values of alternatives

Criteria / Alternatives	f_1	f_2	f_3	f_4	f_5	f_6	f_7	f_8
a_1	0,161	0,043	0,017	0,023	0,015	0,044	0,026	0,155
a_{16}	0,161	0,048	0,017	0,023	0,015	0,044	0,026	0,155
a_{46}	0,159	0,012	0,080	0,112	0,075	0,038	0,077	0,124
a_{59}	0,049	0,129	0,080	0,027	0,075	0,035	0,077	0,050
a_{66}	0,033	0,134	0,080	0,027	0,075	0,032	0,077	0,050
a_{73}	0,022	0,138	0,080	0,027	0,075	0,029	0,077	0,050
a_{80}	0,015	0,141	0,080	0,027	0,075	0,026	0,077	0,050
a_{87}	0,012	0,143	0,080	0,027	0,075	0,024	0,077	0,050
a_{88}	0,142	0,014	0,080	0,109	0,075	0,064	0,077	0,050
a_{95}	0,045	0,019	0,080	0,112	0,075	0,074	0,077	0,050
a_{102}	0,031	0,020	0,080	0,109	0,075	0,086	0,077	0,050
a_{109}	0,021	0,021	0,080	0,109	0,075	0,100	0,077	0,050
a_{116}	0,014	0,024	0,080	0,109	0,075	0,115	0,077	0,050
a_{123}	0,011	0,026	0,080	0,109	0,075	0,134	0,077	0,050
a_{130}	0,125	0,087	0,010	0,051	0,075	0,155	0,026	0,012

Source: own elaboration.

Selection of the optimal alternative of assets financing

Using the weighted sum of the global weights of criteria (see Table 4.) and normalized criteria (see Table 5.). Identified using utility function $U(a_i)$ against which a sequence of alternatives is compared. Summarization of these values is shown in Table 6.

Table 6 - Results of the best alternatives

Alternative	Provider	U(ai)	Rank of alternatives
a_1	ČSOB Lečasing –finance lease	0,083	5
a_{16}	ČSOB Lečasing –finance lease	0,084	4
a_{46}	**Komerčná banka ESSOX – loan**	**0,105**	**1**
a_{59}	Komerčná banka ESSOX – loan	0,062	6
a_{66}	Komerčná banka ESSOX – loan	0,057	8
a_{73}	Komerčná banka ESSOX – loan	0,052	11
a_{80}	Komerčná banka ESSOX – loan	0,050	14
a_{87}	Komerčná banka ESSOX – loan	0,049	15
a_{88}	Komerčná banka ESSOX – loan	0,098	2
a_{95}	Komerčná banka ESSOX – loan	0,061	7
a_{102}	Komerčná banka ESSOX – loan	0,056	9
a_{109}	Komerčná banka ESSOX – loan	0,052	10
a_{116}	Komerčná banka ESSOX – loan	0,051	12
a_{123}	Komerčná banka ESSOX – loan	0,051	13
a_{130}	Česká sporiteľňa – loan	0,091	3

Source: own elaboration.

According to the method of AHP and the weighted sum the best form of financing is considered the alternative a46. In this alternative, the decision maker does not have to spend its own funds, because the amount of credit granted will cover the full cost of property i.e. the amount of 726 000 CZK . Reimbursement factor in this case is the lowest of all 15 financing options. Given the fact that this is a loan, the decision maker is instantly an owner of the asset, administrative costs are lower compared to financial leasing. The disadvantage of this option is one of the highest monthly payments of 63,322 CZK. In the second place was a loan (alternative from the same provider with similar characteristics as a variant a 88). The third alternative is also a loan with the amount of 726,000 CZK, with one of the lowest coefficients of reimbursement and also one of the lowest monthly annuity of 16 080 CZK. Variations of financial leasing are in the order in fourth and fifth place, for which the following parameters are preferred: amount owed corresponding to the asset value, the user will become the owner until the finance lease repayments coefficient has the highest value (for alternative a16 1.351 and 1.318 for alternative a1), monthly payments are moving around in the middle of the comparison interval, and in addition include insurance. Fees associated with these financial products are minimal and the minimum is the distance between provider's branches and decision-makers offices.

4. Sensitivity analysis of alternatives

Assessed and ranked the 15 selected variants of financing assets and the subsequent finding optimal variant, it is important to know whether that choice is stable respectively, which is sensitive to changes in weights of each criterion through sensitivity analysis. Based on this analysis following equations (2.6) to (2.9) uncover changes detected in weights recorded in Table 7.

Table 7 – Normalized weight changes (necessary for change in the ranking)

Criteria	Coefficient alpha	Changes of normalized weights needed for changes in the ranking (in %)								New optimal alternative
		f_1	f_2	f_3	f_4	f_5	f_6	f_7	f_8	
f_1	*-0,369*	-35,3	6,2	3,1	6,5	12,8	3,2	1,8	1,7	a_{123}
f_2	*0,196*	-6,5	14,7	-0,9	-1,8	-3,6	-0,9	-0,5	-0,5	a_{130}
f_3	*-0,212*	10,7	2,8	-25,4	3,0	5,9	1,5	0,8	0,8	a_{130}
f_4	*-0,242*	12,7	3,4	1,7	-28,4	7,0	1,7	1,0	0,9	a_{130}
f_5	*-0,366*	22,9	6,1	3,1	6,4	-45,2	3,1	1,8	1,7	a_{16}
f_6	*0,127*	-4,5	-1,2	-0,6	-1,2	-2,5	10,6	**-0,3**	**-0,3**	a_{130}
f_7	*-0,288*	16,1	4,3	2,2	4,5	8,8	2,2	-39,2	1,2	a_{130}
f_8	*0,717*	-16,6	-4,4	-2,2	-4,6	-9,1	-2,3	-1,3	40,5	a_{16}
Former weights		*39,7*	*10,6*	*5,4*	*11,0*	*21,9*	*5,4*	*3,1*	*3,0*	-

Source: own elaboration

From the data shown in the Table 7 it is apparent that the most sensitive criteria weights are f_7 (administrative cost of financial product) and f_8 (distance from branches).

New (amended) scales, which induce changes in the sequence of variants (or a change in place of the optimal alternative), are placed in Table 8.

Table 8 – New weights (necessary for change in the ranking)

Criteria	Alpha coefficient	Normalized weights needed for change in the ranking of alternatives (in %)								New optimal alternative
		f_1	f_2	f_3	f_4	f_5	f_6	f_7	f_8	
f_1	*-0,369*	4,4	16,7	8,5	17,5	34,7	8,6	4,9	4,7	a_{123}
f_2	*0,196*	33,2	25,2	4,5	9,2	18,3	4,5	2,6	2,5	a_{130}
f_3	*Criterion is not sensitive towards the change in the weight.*									
f_4	*Criterion is not sensitive towards the change in the weight.*									
f_5	*Criterion is not sensitive towards the change in the weight.*									
f_6	*0,127*	35,2	9,4	4,8	9,8	19,4	16,1	2,7	2,6	a_{130}
f_7	*Criterion is sensitive to the change in the weight.*									
f_8	0,717	23,1	6,1	3,1	6,4	12,7	3,2	1,8	43,5	a_{16}
Former weights		*39,7*	*10,6*	*5,4*	*11,0*	*21,9*	*5,4*	*3,1*	*3,0*	-

Source: own elaboration.

The conducted sensitivity analysis shows that the choice of the optimal alternative is most sensitive to the scale of the seventh criterion (administrative cost). When changing the balance of the seventh (or eighth) criteria from the original 3.1% (or at f_8) a decrease of 0.3 % to 2.7% (or 2.6%) a situation in which the optimal variant a_{46} and a_{130} will have the same criteria weights that they could be equivalent possibilities. If there would be a change that would result in a reduction in the level of the seventh criteria below 2.7 % (or 2.6% below the eighth criteria), the optimal alternative would become the a_{130} alternative. The third most sensitive criterion is the weight of the third criteria (related to fees) and sixth criterion (insurance included in the annuity).

Due to the fact that changes found within criteria are small in absolute amount, it would be appropriate to conclude that the decision is not very significant. Sensitivity analysis has shown, however, these are the most important criteria. If these criteria were not taken into account (for example, just because of the low preference), an alternative would be recommended, which is not optimal.

Conclusion

Investment decisions are crucial business activities. Its consequences are long-term and cost considerable funds. For these reasons, it must always be considered when deciding a number of criteria, which may have a conflicting nature. To address such problems, it is possible to use methods of multiple criteria decision making. The most comprehensive method of multiple criteria decision is the decomposition method of analytic hierarchy process (AHP) because it is this method that allows analyzing the problem to lower levels, thus ensuring detailed solution to the problem.

The aim was to assess the contribution of a set of variants of two types of financial products (financial leasing and bank loan) by the method of AHP and a weighted sum followed by choosing the optimal alternative and implement a sensitivity analysis of alternatives. Given the extensive initial set of 132 alternatives a two-stage assessment of these variants was utilized. Financing options were assessed according to four financial and four non-financial criteria.

In the first stage groups were created (by type of financial product, according to the provider and the period of repayment of the product that is, the time commitment). This comparison was selected from each group of variants with the highest utility function. Subsequently, in the second stage of decision-making 15 variants were assessed of which were in the best alternatives selected. The best alternative seems to be a_{46}. This is a loan provided by KB (namely ESSOX). The most

preferred criterion is the amount owed by the decision maker to the provider of the financial product; its significance is the characteristic value of 0,397 (39.7 %). The order of the first five variants of funding (three bank loans and two financial leases) reaches the maximum desired value i.e. the cost of the asset. It follows that in these cases the decision maker does not have to spend own resources.

The result of the analysis process is a sequence alternatives, where the first three options for assets financing (based on comprehensive criteria) are bank loans with different variations of individual criteria values. Following fourth and fifth option to acquire an asset are basically financial leasing.

After assessment of selected variants and determination of their order the sensitivity analysis was carried out. From this analysis, it can be considered that the most sensitive criteria preferences. Specifically these are the criterion of administrative costs and the decision maker criterion of distance from the nearest branch provider.

It was conducted based on the application of clear definition of the criteria, their values and determination the level of interest criteria affects the selection of optimal financing options of a property.

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ALLOCATION OF PUBLIC FUNDS FOR RESEARCH AND DEVELOPMENT IN A SMALL COUNTRY: THE CASE OF MOLDOVA

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Abstract:

Public funding for research and development is an important instrument of state innovation policy, particularly in countries with modest private investment in research. Allocation of public funds must take into account both the need to ensure the sustainability of R&D activities and the promotion of excellence research and ensuring economic and social impact. Small countries face additional problems in the process, especially related to the objective evaluation of projects' proposals. The paper examines the case of Moldova, focusing on the allocation of public funds, on specific problems and possible ways to improve this process. There has been a reduction of their competitive financing, poor compliance with the principles of peer-review and insufficient involvement of experts from abroad, the lack of clear criteria for the allocation of institutional funding. However, the current way of public funding does not stimulate R&D and industry cooperation. The findings suggest the need to strike a balance between different modes and tools of public funding for R&D in Moldova.

Keywords: public R&D funding, allocation policy, institutional funding, project funding, research governance.

JEL Classification: H59, O31, O38

1. Introduction

It is now widely recognized that knowledge is the currency of the new economy, and research and innovation capacity, created on a solid public scientific base, is essential to a sustainable economic recovery. Public funding for research and development (R&D) is one of the principal means of state intervention in the processes of innovation and the pursuit of research and innovation policies. To achieve the objectives, an efficient utilization of public funds for R&D is required. In this respect, countries restructure and adapt their research funding mechanisms (ERAWATCH 2014). In turn, the European Union promotes the increase of competitive funding and the improvement of public funds distribution assessment (EC 2012).

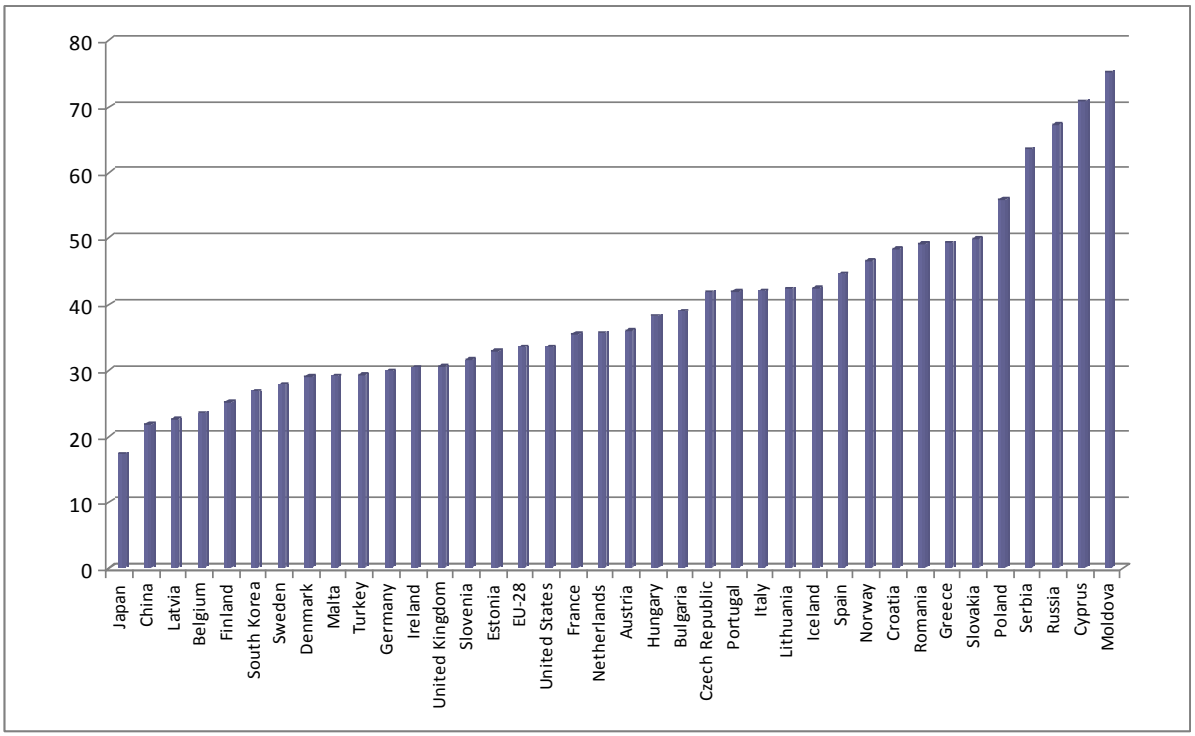
In the small states, there are particular challenges in developing an effective and efficient framework for funding R&D (see ALLEA 2002; Fabri 2013).In this context, we aimed to analyze the distribution of public funds for research and development in Moldova, focusing on their allocation, specific problems and on finding possible ways to improve this process.

2. The role of public funding in Research and Development in Moldova and methodological aspects of estimating it

Public funding is a major component of investment in research and development within the national R&D. Public funding of research is expressed most often by two concepts: government-financed gross expenditure in R&D (government-financed GERD), and Government Budget Appropriations or Outlays for R&D (GBAORD). The government's GERD is estimated based on the executants' reports of R&D and includes research and development exclusively within the national government funded at all levels (central, regional, etc..) and GBAORD - based on funders reports, which include R&D principally financed by the central government, also intended for executants from abroad (OECD 2002).

Per countries, the public funding ratio varies significantly, generally from 17 to 70%, with an average between 30 and 35%. Of the most important players in the world, Japan and China recorded the lowest values of the share of public funding - about 1/5 of the total, while the EU and the US are characterized by similar values - about 1/3 of the total R&D funding (see Figure 1).In most countries, public funding is the second major source of funding for R&D, and in a few countries is the most

important source. Generally, it appears that the share of public funding tends to be higher in less industrialized economies, where private funding in R&D is poor.m In advanced economies, which are provided enough by private funds for R&D, public funding is usually used as a support tool for obtaining certain knowledge considered to be of benefit to society, but that cannot be secured through the competitive mechanisms of the market because of their characteristics.



Source: prepared by the authors based on EUROSTAT and their own estimates for the Republic of Moldova; the dates refer to 2011, with the exception of Japan and South Korea, for whose dates are for 2010

Figure 1. Proportion of public funding of all R&D funding in %

For Moldova, the public funds are a major source of funding for R&D because of a weak involvement of the private sector. It ought to be mentioned that the data for Moldova is estimated because the National Bureau of Statistics (NBS) does not keep any record R&D expenditures by sectors. However, these figures reflect the general perception and show little interest in the local business sector research and innovation. The reduced involvement of the business sector is due to the low level of innovative culture, weak links between research and entrepreneurship, unfavorable structure of investments in research and the small size of the economy, the distribution of non-stimulating foreign direct investment (PRO INNO Europe 2011). The modest private investments in research and development, and respectively, the contribution to economic growth can be explained by "the legal and normative background of the country in the sense of support the law and finance view" (Garofalo and Morganti 2010).

In approximating the value indicated in the figure (about ¾ of the total R&D funding) were taken into account the following factors:

- UNESCO Institute for Statistics indicates in 2011 a share of external funding for R&D for Moldova of 9.4% of total funding;
- The data of the Academy of Sciences of Moldova (ASM) indicates modest values from the private sector's financing through the funding schemes they used;

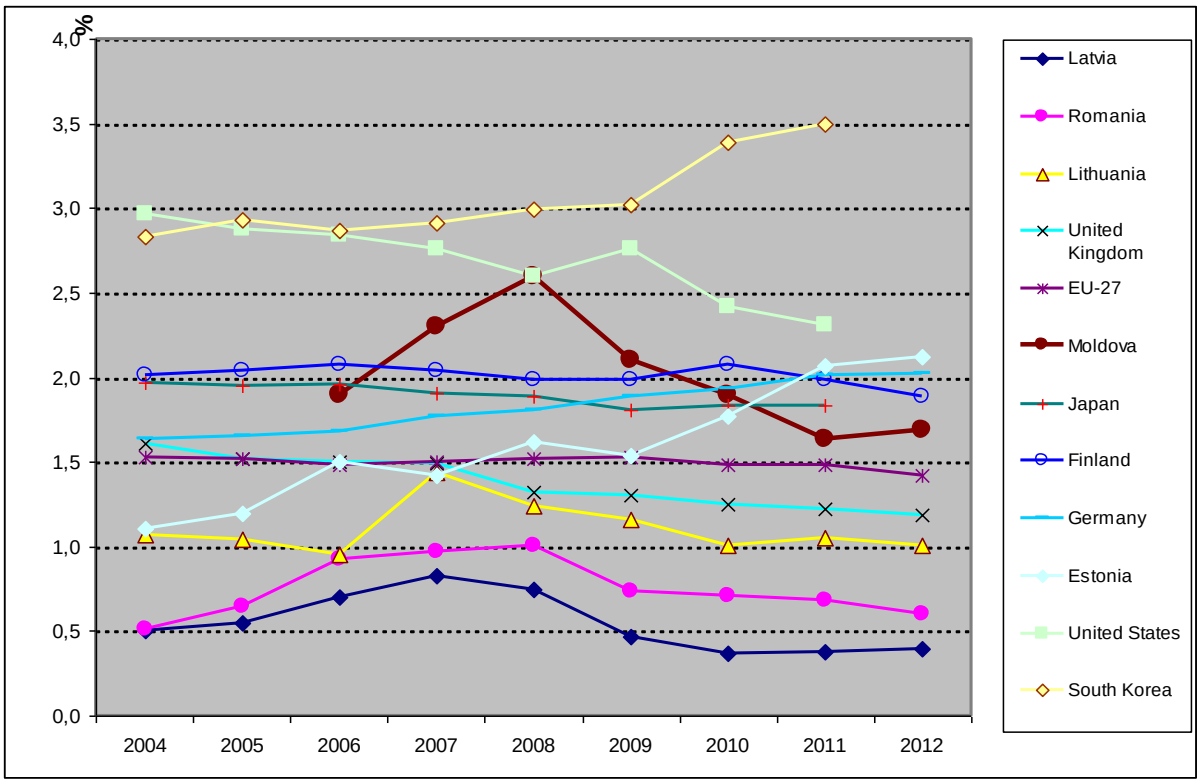
NBS indicates a small number of research and development institutions outside the governmental and academic sector.

It should be noted that in Moldova even the general public university funds are not taken into account when estimating expenditures in R&D, as recommended by statistical methodological manuals. This is explained by the fact that these funds are not designated as a destination for research

and education and there is no rule that would stipulate what percentage of GUF should be used to finance research and development.

Given these circumstances, we still use the term public funding for research and development in the Republic of Moldova as defined GBAORD, whose main source of reports is the Ministry of Finance and the Academy of Sciences of Moldova. Public funding for research and development is included in the state budget of the Republic of Moldova in Chapter 7 "Science and Innovation". In absolute terms, these funds are modest ranging around 20 million Euros annually, going down from 22.9 million in 2008 to 19.2 million in 2010. As a share of GDP, public funding for R&D decreased from 0.66% in 2008 to 0.35% in 2012 (Spiesberger and Cuciureanu 2013). Distribution of public finance for R&D is centralized and carried through the ASM.

Republic of Moldova has a high share of spending on R&D of the total government expenditure. Thus, if in 2008 was recorded the maximum value at the national level (2.6%), Moldova was on par with the US and ceded only to South Korea by this indicator (see Figure 2). With the global economic crisis, this indicator decreased significantly, Moldova fits in the category of countries that responded to the crisis by cutting public funding for research, unlike South Korea, Germany, Estonia, Czech Republic, etc., which have intensified research in the public sector. However, the Republic of Moldova was situated, in 2012, over the majority of the region and the EU on this indicator (1.69%, and, respectively, 1.42%). This demonstrates that public authorities are doing some efforts to "scienticise" the society, and satisfactory assurance of the research and development of financial resources is mostly due to not engaging the business sector (Canţer *et al.* 2013, 275). Overall, the national research and development system remains vulnerable to an unstable political and economical context, facing the long-term consequences of chronic underfunding.



Source: Developed by the authors based on EUROSTAT data and the reports from the Ministry of Finance of the Republic of Moldova

Figure 2. The share dynamics of public R&D funding of total government expenditure in some countries

3. Main ways of allocating public funding for research and development

The ways of allocating public funding refer to the ways that public funding for the research and development system reaches beneficiaries, the organizations responsible for funding and the types of instruments used. There are two primary ways of public funding for R&D: institutional and on a project basis.

Institutional funding is financing directly attributed to public research institutes or universities, with no selection of projects and programs that will be carried. Such funding is allocated using different allocation algorithms that can take into account the evaluation of institutional performance. In turn, the organization that receives institutional funding has the right to allocate the money at its discretion and to determine the research it will conduct.

Project based funding is funding through a competitive and open process. An accepted definition of this type of funding is: funds allocated to a group or a person in order to perform a research and development limited by purpose, budget and time, normally under the submission of a project proposal describing the research activities that will be carried (Lepori *et al* 2007, 374). This type of financing is used primarily as a tool to guide research towards political and economic objectives. The main criteria for the delimitation of the two financing types are (Steen 2012, 9):

- purpose of the financing instrument in terms of granting authority rather than actual use of funds for research and development;
- existence of institutions (agencies, academies or councils) responsible for selecting the projects that will be financed and allocating money to the beneficiaries.

While both types of R&D funding allow resource allocation on a more or less competitive base, funding project proposals through grants is considered a purely competitive funding. Therefore, for the delimitation of funding after the two major ways in Moldova, an important factor was the competitiveness of the instruments that were used.

When choosing how to finance R&D it is useful to consider the following three dimensions:

- *Selectivity* - refers to the degree to which there is a priority between fields. Policy decisions may concern the share of resources that will be made available for research on predefined priorities and a general one, without any thematic focus;
- *Concentration* - addresses the issue of their institutions and their research teams that need to be supported and relate to the extent to which funding should focus on the best of them;
- *Sustainability* - describes whether the funding model allows restoring human and physical capital within the research suystem, and therefore maintains and develops institutions in the long-term.This feature can only be measured over time (EC 2013a, 11).

For the distribution of public funds for research and innovation, the EU recommends to the Member States:

- to introduce or enhance competitive funding through call for proposals and institutional assessments as the main modes of allocating public funds to research and innovation, introducing legislative reforms if necessary;
- ensure that all public bodies responsible for allocating research funding apply the core principles of international peer review (EC 2012, 6)

Countries are modernizing their research funding mechanisms through the creation of new agencies responsible for allocating public resources, the increasing use of competitive funding on a project basis, correlating more closely social and economic targeted funding, focusing on the quality and relevance of research institutions to achieve excellence in research and an economic and social impact (ERAWATCH 2014). In smaller countries three main groups of challenges exist for an efficient and effective public funding for R&D, according to the ERA-Prism project report „The Challenges faced by R&D Public Funding Systems in small (and transition) countries", and refers to setting priorities, the human capital and stimulating investment in the private sector's research and development (Fabri 2013).

4. Institutional research and development funding

Institutional funding may take different forms, varying according to the degree of competitiveness of the allocating mode. Although there is a degree of freedom for the institution in the distribution of these funds, the institution must take into account several factors such as general

objectives and strategies established by funders, legislation and regulations. Institutional funding can be allocated non-competitively based on some factors such as historical precedent or, more often, based on some formulas that take into account the number of units of researchers, equipment maintenance costs, etc.; but more countries apply performance criteria based on the distribution of these funds. Scientific excellence is the most important criterion used, determined by means of indicators such as number of publications, citations, patents, awards (ERAWATCH 2014).

Although institutional funding is decreasing in the world, it still does not fall below a certain level in different countries. This is because institutional funding has shown some advantages in comparison with the purely competitive one:

- provides the necessary freedom for researchers to develop ideas that, in competition, could be considered too risky;
- allows institutions a greater autonomy in setting research strategies, while avoiding the risks of concentrating only on certain required research;
- offers secure funding for a long-term development (sustainability); provides equipment and support services that can be paid more difficult through grants.

In Moldova, in addition to funding projects that gathers the elements of competitive funding, there are two other important ways of financing:

- block grant, distributed outside of projects;
- institutional projects for fundamental and applied scientific research.

The first type of funding is intended for science management bodies (the Supreme Council for Science and Technological Development, the National Council for Accreditation and Attestation), their subordinate agencies (eg, the Agency for Innovation and Technology Transfer, Centre for Fundamental and Applied Research Funding), innovation infrastructure (scientific and technological parks and innovation incubators), Central Scientific Library and capital investments. The decisions about block funding are taken by the Supreme Council for Science and Technological Development (SCSTD), the executive body of the ASM, and the distribution of funds in major compartments is fixed in the Partnership Agreement between ASM and the Government. This funding type constitutes about 15% of total public R&D funding.

Institutional projects have both institutional and competitive funding features. Under the existing legal framework, this type of financing is implemented on a competitive basis by organizing competitions for project proposals. The competition is open to only organizations accredited by the National Council for Accreditation and Attestation (NCAA). Proposals are submitted to The Centre for Fundamental and Applied Research Funding (CFARF) and then are evaluated by the Advisory Council of Expertise (ACE) and SCSTD approves any funding decisions. Note that all three structures compose the ASM. However, entrepreneurship representatives or other interested parties for research and development are missing in consultative and decision-making bodies for public funding distribution.

In fact, all procedures for financing projects are observed only formally, thus there is no real competition. The proposals do not compete with one another, because the amount of funding per institution is already more or less predetermined (Spiesberger and Cuciureanu 2013). There was never a situation where an institution that had previous institutional funding has not earned an institutional project for the next period (the maximum duration for institutional projects is 4 years). When an institution submits proposals with the total financing volume higher than pre-established and they are positively evaluated by experts, this institution is proposed to decide whether it selects only the amount of projects that fall into the sum or it reduces funding to all. However, any criterion by which the amount of institutional funding will be distributed by institutions is not made public. The volume given to research institutions is "rather determined, allegedly from the conducted interviews, by the relationships they have with ASM management" (Popa and Prohnițchi 2011, 31).

The lack of compliance with competitive procedures of this type of financing is also attested in the reports of the Court of the Republic of Moldova, supreme institution for external public audit. Thus, a check carried out in 2011 revealed a lack of assessment, and respectively, participation in the competition for a significant number of institutional proposals, which have been funded (Court of Accounts 2011).

It should also be noted that the topic of institutional projects is proposed exclusively by the institutions to which they are submitted and basically there is no restriction in terms of subject. From

the above arguments, we considered that the institutional projects in Moldova can rather be attributed to institutional funding and we have treated it as such in this study.

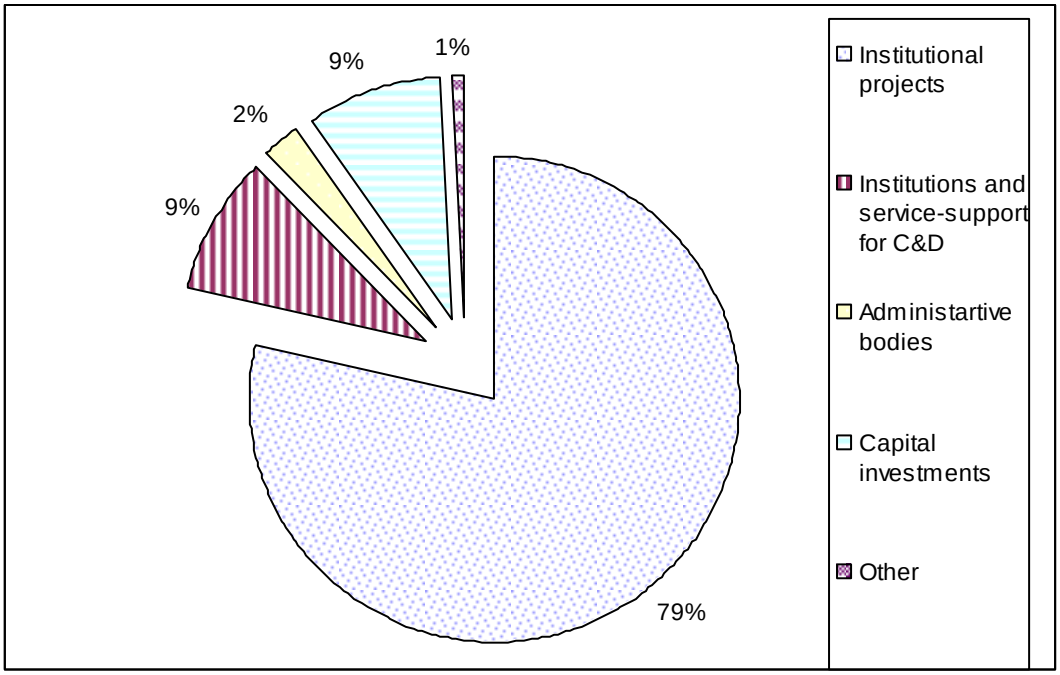
Institutional projects represent the most significant public funding of research in the Republic of Moldova, the share of which has been increasing in recent years (see Table 1).

Table 1. The dynamics of institutional projects funding in Moldova

Years	2006	2007	2008	2009	2010	2011	2012
The volume institutional project funding, million MDL	111,1	170,2	213,5	201,8	207,6	207,4	221,4
The share from public funding for R&D, %	63,0	60,8	59,4	63,7	66,6	73,7	72,8

Source: calculated by authors based on the annual reports of the ASM;
Note: 1 Euro = 16 Lei MD

Together, block funding and institutional projects constitute about 85% of all public funding. The structure of institutional funding is shown in Figure 3.



Source: calculated by the authors based on the annual reports of the ASM

Figure 3. The structure of institutional funding for R&D in Moldova in 2008-2012

NCAA performs institutional evaluation of R&D organizations in Moldova. The evaluation criteria refer to the scientific results, their applicability and implementation potential, staff competence, internal and international collaboration. In 2011 NCAA has implemented a new methodology for evaluating and accrediting organizations. The evaluation criteria take account of the field of science in which the organization works. The accredited institutions are classified into three categories: nationally competitive organization; internationally competitive organization and internationally recognized organization (NCAA 2011). The assessment and classification of organizations carried out by NCAA is not taken into account however in the distribution of institutional funding. Meanwhile, at least 21 EU Member States have stipulations of correlation, partial or total, of institutional funding with performance. In 2013 in at least 5 Member States were introduced new stipulations or were improved the procedures (EC 2013b). In advisory or the decision-making bodies for the allocation of public funds are included representatives of the government, the scientific community, entrepreneurship and society in general.

5. Competitive financing through projects

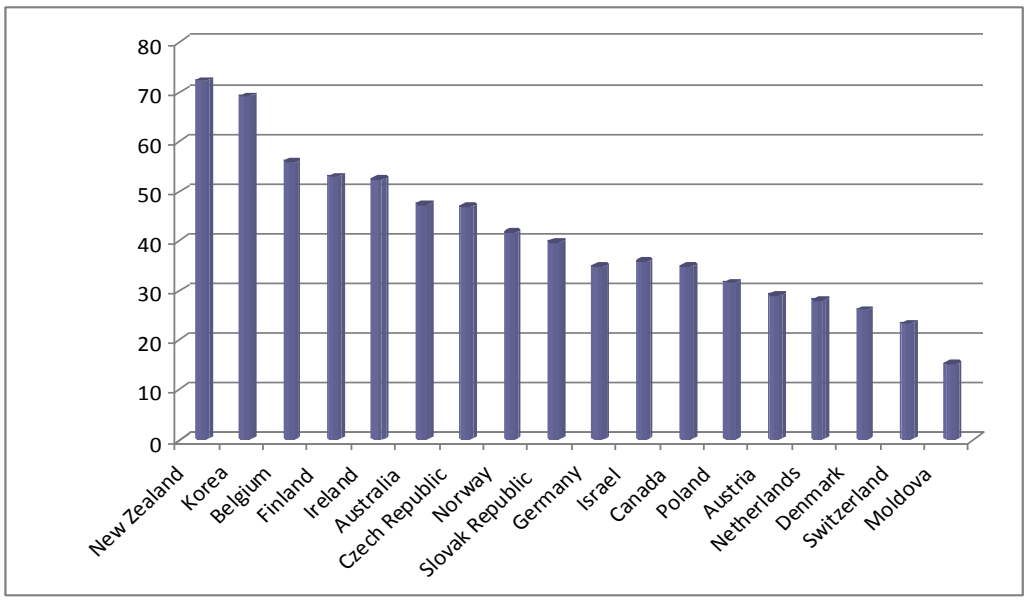
It is generally recognized that increased competition causes higher performance. Studies show that excellence in research is related to the competition between researchers and the evaluation of their proposals using internationally comparable criteria; there has been a clear relationship between a competitive environment for academic research funding and the system's efficiency and productivity as measured by the number of publications per one unit of invested funds (Auranen and Nieminen 2010). Thus, it was shown that every percent of a university's budget awarded through competitive grants leads to an increase of 6.5 points in the Shanghai ranking of universities in the world (Aghion *et al.* 2009, 12).

However, this correlation is not so linear and there it is unreasonable that all funding is distributed through competition. It is necessary to take into account other features of competitive funding:

- focus more often on a set of predetermined priorities, usually with a potential socio-economic impact (scientific correlation specialization – economic necessity);
- focus on the best research teams, and contributing less to the formation of new human resources in research;
- limited autonomy of institutions to establish research programs and develop their specialization;
- ensure less the institution's sustainability, but allows flexibility and can ensure a greater accountability for public spending;
- cost and time for preparation and evaluation of proposals does not differ significantly depending on the amount of funding, so that even the small competitions of grants can become expensive.

Therefore, research in Europe is increasingly being financed by a mix of institutional funding and project funding. The most common reasons cited for the adoption of new methods of funding are: increasing excellence and quality of research, encouraging interdisciplinary research, overcoming institutional and structural rigidities, facilitating the development of networks between institutions and the promotion of young researchers (Maass 2003). With all the implemented changes, it seems that the peer review still has the main role in selecting projects, and ex-post evaluation does not have a relevant impact on the selection of institutions (Poti and Reale 2007).

There is no official statistical record of the share of competitive funding projects, but ERAWATCH experts' calculations and estimates show that this share varies from 20% to 80% among the EU countries (ERAWATCH 2014). OECD data, based on the research of a working group in the field shows us also significant differences between countries (see Figure 4).



Source: the ASM reports on the years 2010-2012 (Moldova); OECD data for 2008 (Steen 2012, 21)

Figure 4. The share of competitive public funding of all projects of public funding for R&D (in %)

In Moldova, the share of truly competitive financing projects is low, averaging about 15% in 2010-2012. If we exclude the financing of doctoral grants (those provided from the public funds for

R&D until last year), which is competitive, but not project based, then this share was of only 9% in 2012, reducing from 12% in 2010. There is a decreasing trend of competitive funding in the context of a stagnating funding of the public sector. The ASM, which organizes the competition according to the same procedures as institutional projects, apparently decided to reduce competitive funding in order to secure core funding of institutions.

The most important instruments of competitive funding through projects, according the amount of public funding in the period 2008-2012, are state programs in research and development (3.6% of total public funding) and innovation and technology transfer projects (3.7%) (see Table 2).

Table 2. The dynamics of public funding through the main competitive financing instruments (projects) in Moldova (million Moldavian lei)

Years	2006	2007	2008	2009	2010	2011	2012
State programs in research and development	11,0	19,9	17,8	17,0	9,8	5,8	5,5
Independent projects*	1,3	2,0	4,3	4,4	5,2	4,9	6,1
International projects	0	5,2	6,5	8,3	7,7	6,7	4,4
Innovation and technology transfer projects	3,0	8,3	11,5	12,0	13,8	11,0	10,0

Source: Annual reports of the ASM SCSTD

**Note: Independent projects include projects for young scientists and projects for the procurement of scientific equipment (the last only for some years)*

State programs are the main competitive tool for public funding for R&D according to national legislation. They are developed by ASM in consultation with other stakeholders. The programs are approved for a period of 4 years with annual funding and reporting cycles. Projects competitions under existing programs are organized annually by CFARF. Since the beginning of these programs in 2004 and until 2012, 26 thematic programs have been implement, in which 317 projects were financed (amount - 6.4 million euro).

Innovation and technology transfer projects attempts to connect research with entrepreneurship. The program is administered by the Agency for Innovation and Technology Transfer (AITT) under ASM. The selected projects are funded in annual competitions for a period of up to two years. Eligibility conditions require that at least 50% of the project's total cost is funded by non-public sources.

In the framework of "International Projects" bilateral joint R&D programs are funded with key partners such as Germany, Romania, Italy, France, Ukraine, Russia etc. Public funding covers the cost of Moldovan researchers' participation in joint programs. The competitions are organized by the Centre for International Projects of the ASM.

Scientific equipment procurement projects are funded since 2007. The procurement of equipment for joint use of several organizations is encouraged. Projects for young researchers are also funded since 2007. The competitions are announced annually and the maximum duration of the project should not exceed two years. The eligibility criteria require the presence in a team of at least 4 young scientists under the age of 35 years, including the project director.

Two other competitive tools have been implemented in the past two years: grants to organize scientific events and grants for publishing monographs. The last four listed tools are managed by CFARF.

For all competitive financing tools for projects, the evaluation of proposals is carried out by the ACE of the ASM. Making an objective assessment is one of the key issues in the competitive distribution through public funding for R&D projects. Basic principles of their evaluation, recognized internationally: relevance, excellence, fairness, transparency, quality, privacy, ethics and integrity (ERAC-GPC 2010) - in many cases are not followed. The main causes of such situations are:

- the small size of the local scientific community and the difficulty of finding experts who won't be in a conflict of interest, and on the other hand the involvement of external experts is insignificant;

- the concentration of all political functions and management of research and development in the ASM and the lack of real autonomy of the institution of experts;
- the lack of prioritization of internationally recognized results and a high share of local origin indicators and non-scientific criteria.

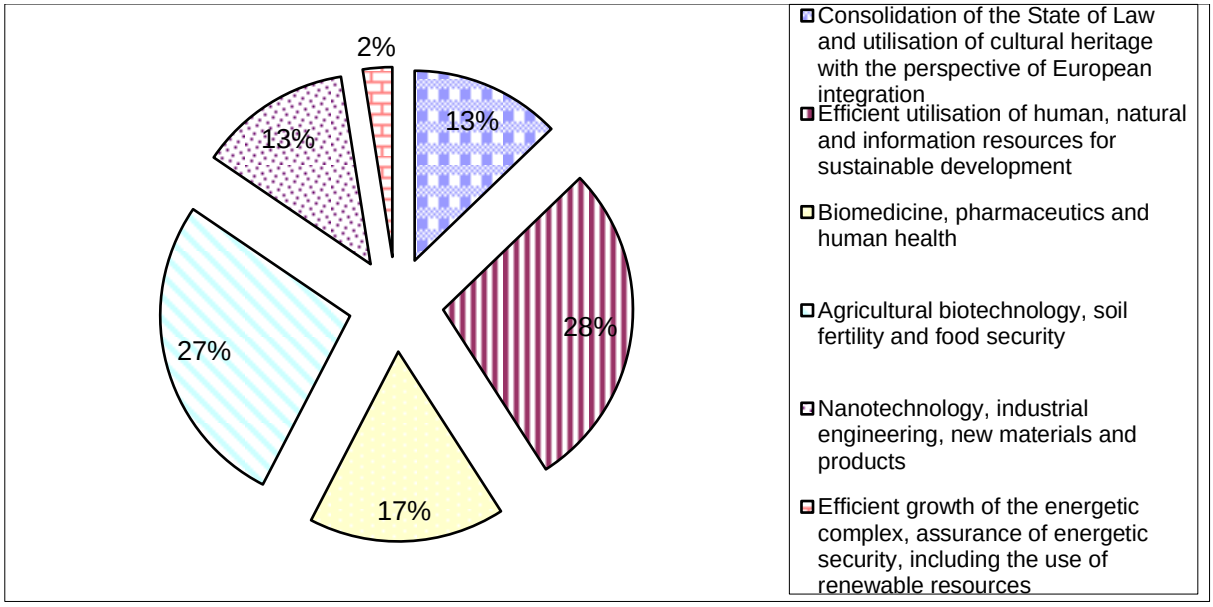
The situation is somewhat common with other Central and Eastern European countries that have or have had a transitional period to the competition based model (Radosevic and Lepori 2009).

As a result, in Moldova are reported deficiencies in performance evaluation, some of which mentioned in the reports of the Court of Auditors (No. 67 of 25/09/2007, no. 48 of 29/10/2009 and no. 19 of 16/04/2011): not encouraging the competitiveness of funded projects, both in research and in technology transfer, as well as financing projects outside competition; an inadequate management of conflicts of interest in the evaluation of proposals, as there were identified situations where experts involved in the expertise of the projects were later engaged in the projects; a lack of clear and objective criteria for the selection of projects, of monitoring indicators for the implementation of projects and criteria for evaluation of implemented projects; the approval of projects that were previously endorsed negatively by the EAC.

By comparison, the use of assessment procedures (*peer review*) resulted in the gain of transparency and quality of research funds' allocation in the European Research Area. In all EU countries (with two exceptions) there are stipulations for using the basic principles of evaluation, nine of these countries already adopting these criteria in 2012 (EC 2013b). In several EU countries, particularly in Eastern Europe, there are formal and explicit stipulations to include a share of experts from abroad. In countries with a custom in assessment there are no explicit formal requirements on the involvement of international experts, but this is part of their culture of assessment (JRC 2013, 59).

6. Other aspects of the distribution of public funding for research and development in Moldova

For the distribution of public funds, it is formally taken into account the strategic directions in the field, approved by the decision of Parliament. By 2013 there were 6 strategic directions in effect, to which have been distributed public funds quite unevenly (see Figure 5)



Source: prepared by the authors based on data from The ASM SCSTD Report for 2012

Figure 5. The distribution of public funds for R&D in Moldova after the strategic directions in 2012

If we compare the national priorities with those of the EU 7th Framework Programme (the thematic priorities of the Cooperation Programme) it can be stated that they are largely similar. It notes, however, differences in the weight of each priority, which seems to reflect the level of development and the grade of building the knowledge society. In Moldova, a much lower share is invested in research related to the information society, transport, and environment. In contrast, research related to agriculture receives a support of almost 5 times higher, in relative terms, compared

to FP7, which otherwise is explainable by the economic specialization and the meeting of competitive advantages in this field. Energy research is highlighted as a priority in both entities, however in Moldova they are financed about 2.5 times less than in the EU, even if nationally this sphere has pressing problems. An exception to the overall pattern that's reflected is support for research in the field of nanotechnology in Moldova, investing financial resources is justified by the relatively high specialization of the national R&D and the results recorded by Moldovan researchers in this field.

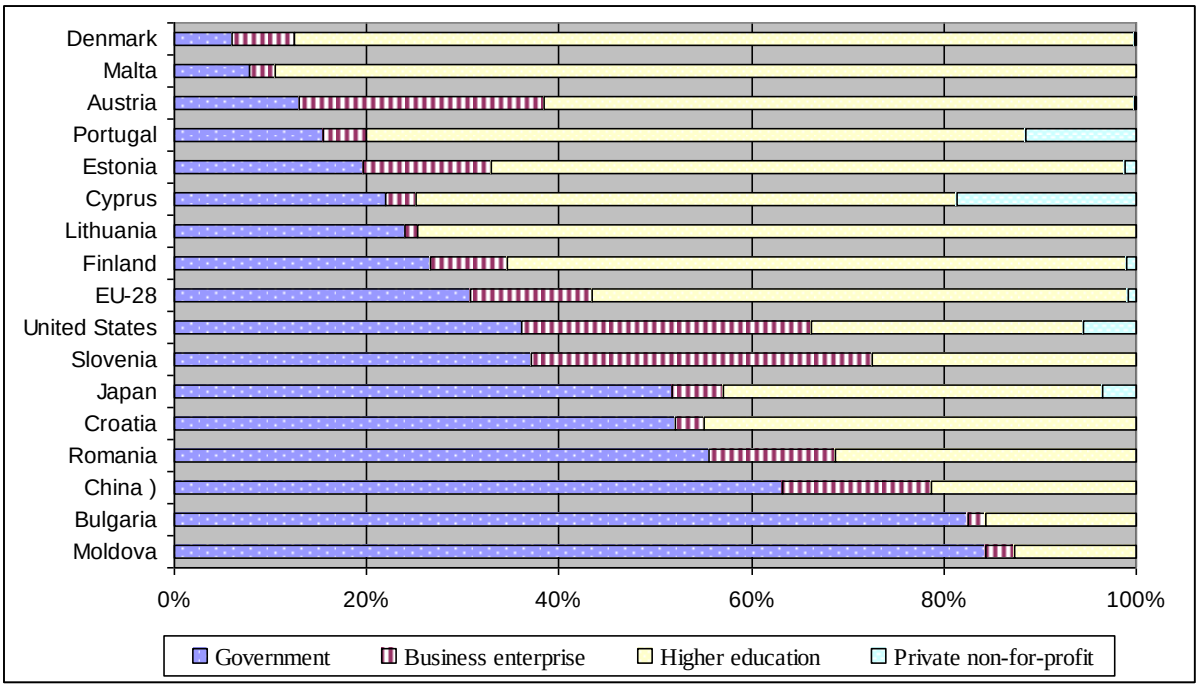
These areas of priority are quite broadly formulated (that can include any scientific activities) and there are no clear mechanisms through which public funds would focus on priorities. There is a lack in well-defined areas (niches) that would focus resources, making it difficult to support competitive areas of the economy or to encourage technological specialization.

Most used instruments are generic, and procedures for funding, evaluating, monitoring and reporting are identical for all thematic priorities. The distribution of public accounts follows a more from bottom to top approach – usually in announcing contests the researchers can submit any proposals in all strategic directions.

From the financial instruments, only state R&D programs are focused thematically. It is a mixed scheme which includes top to bottom and bottom to top approaches in setting priorities: the programs' conceptions are submitted by researchers, for deciding the state programs, who then must take into account the interests of various stakeholders (ministries and agencies). However, the finances allocated for this measure are modest, reducing more than 3 times over the last 5 years.

Distribution of public funding for R&D at a territorial level confirms the exceptional role of the capital in Moldova. In 2012 only 5.3% of institutional project funding was allocated to organizations outside Chisinau.

Most public funding for R&D is assigned to Moldova for the public sector institutions with a higher share than in other countries (see Figure 6). A bit closer is the public funds allocation structure by sectors in Moldova by certain former socialist countries. The higher education sector is however more poorly funded even compared to these countries.



Source: prepared by the authors based on Eurostat data; for Moldova – based on the data from the Official Monitor, special edition, June 24, 2011

Figure 6. The distribution of public funds for R&D by sectors in some countries, in 2011

For the Republic of Moldova the values given are estimates due to lack of official statistics in the field. The estimates are based on the public funding of research projects, without the consideration of the costs for administration, capital investments and other block grants. The structure of public

expenditures for R&D by sectors in Moldova is determined by the current legislation. According to the Code on Science and Innovation, only accredited organizations can benefit from public funding. Following the accreditation, the organizations may become institutional members (ASM institutes), profile members (universities and institutes subordinated to the ministries and departments) or affiliates of the ASM (private organizations). Depending on the achieved status, the organization may require a greater or lesser funding from the state budget, however this status does not depend on the scientific performance of the organization, but on its administrative subordination. Unlike the ASM institutes, which may benefit from a full funding of projects from the state budget, state universities can claim only the status of profile members in the field, allowing them to receive partial funding, by competition, from the state budget, of the applied research, and private universities can claim only the status of affiliated member, allowing them to benefit from a budgetary financing of up to 40% of the total amount of the winning project. Private companies and NGOs have practically no access to public funds due to single criteria for accreditation for all organizations (eg, 13 people with doctorates and founder of a scientific journal).

Conclusions

The mode of R&D funding is a major tool in the reforms undertaken by governments of the countries that are advanced, from a scientific point of view, oriented towards enhancing the national scientific capacity and increasing the contribution of publicly funded research to meet the society's needs. The funding proportion allocated by project competitions is increasing in comparison to the institutional funding in the public sector. Institutional funding is increasingly more often allocated based on performance evaluation, a process involving all stakeholders in the society.

In Moldova there is a reverse trend of reducing competitive financing projects in the context of stagnation (in absolute terms) and decrease (relative values) of public funding for research and development. Institutional projects, even if they meet the formal requirements for competitive funding, cannot be considered a truly competitive instrument in the distribution of public funding because of the particularities of the process.

The lack of an appropriate infrastructure for research, as well as non-attractive working conditions because of chronic underfunding, are limiting factors for achieving excellence in research, but also for increasing the share of public funds allocated through competition. However, the biggest problem in the distribution of competitive finance is a non-objective assessment of project proposals due to the small size of the scientific community and the lack of an evaluation culture. It requires a gradual inclusion of foreign experts in the evaluation of proposals within the competitive funding programs, firstly of experts from Romania and from diaspora (due to the language factor). We find it useful as well the prioritization of internationally recognized scientific results in the evaluation process.

The existing mechanisms for evaluation of institutions, primarily the assessment and accreditation by the NCAA, are not used in the distribution of institutional funding. The score and qualifications awarded to the institutions in this process ought to form an important element of the distribution algorithm of institutional public funding.

The analysis of the distribution of public funding for R&D on other criteria (thematic, territorial, sectoral, etc.) highlights certain imbalances with a negative potential for the development of national research and development. Thus, the "bottom-top" approach for the distribution of public funds contributes to the poor integration of research and development in the national innovation system. The unequal access to public funds is another limiting factor in developing an effective innovation system.

All the evidence suggests the need to strike a balance between different modes and tools of finance in Moldova that will ensure, on the one hand, an efficient use of funds, and on the other hand, the autonomy of the R&D activities. In the process of reconfiguring the allocation mechanism, it should be taken into account the need to increase the proportion of project finance allocated through competitions, the use of organizations assessment as a basic element of the allocation of institutional funding and the effective implementation of the core principles of international evaluation.

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THE ANALYSIS OF ECONOMIC PERFORMANCES USING RETURN ON INVESTMENT

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Abstract:
Having in mind the importance of the investments for the sustainable increase of the company value we propose a model of analyzing the return on investment (ROI) with biannual data from the 2004-2011 period for five companies listed at the Bucharest Stock Exchange. Using the model proposed in the present work we have intended to analyze the relationship between several economical and financial measures and the efficiency of past investments. We have obtained results somehow different to a similar study proposed by Höbarth (2006,) as we operated with a lesser amount of observations, which affected both the number of variables and the relations between the dependent variable and the regressors. After several runs of the model with the STATA program we found that 64% the evolution of ROI was explained by the influence exerted by the determinants of the cash conversion cycle, return on assets and by the relative modification of the sales turnover.

Keywords: economic performances, return on investment, return on assets, balanced panel data, fixed effects, robust errors

JEL Classification: G11, G14, G32, G39

1. Introduction

The importance of the investments for the sustainable increase in the company value is undisputed in the economic business and academic environment. In the same time, the issue of having an efficient follow-up of the investment activities is also essential for the investors and company managers.

In order to describe the efficiency of past investments we can employ a series of measures, which are usually based on the financial accounting data. In this sense, we can mention traditional measures such as return on assets (ROA), return on investments (ROI), return on equity (ROE) or modern measures, such as cash flow return on investment (CFROI), cash value added (CVA), economic valued added (EVA), market value added (MVA).

The efficiency of the capital invested is usually attested should the level of the aforementioned measures is higher than a specific benchmark. In case of the ratio-type measures such as ROI, ROA or ROE, the benchmark is usually represented by the average interest rate, cost of equity or weighted average capital cost. For the measures expressed in absolute values (such as CVA, EVA or MVA), efficiency is obtained if the level of the effect measures is higher than the corresponding level of the effort measures. For instance, in case of EVA the net operating profit after taxes – NOPAT – should be higher than the cost of capital, expressed in absolute figures and not as percentage.

Our analysis' model was inspired by the Höbarth's study (2006), which analyzed the relationship between several economic and financial measures and the company performances. Höbarth supposed there are several general factors, instrumental for the evaluation of each company's success. The Höbarth's study was performed in three different directions, resulting into three different econometric models: the first, referring to the return on invested capital (ROI), the second dealing with cash flow and a third one concerning market value (Firth, Malatesta, Xin, Xu, 2012).

The results obtained from the Höbarth's study confirmed his initial hypothesis, attesting the existence of a clear-cut relationship between a company's profitability and a series of economic and financial measures.

In our study we have analyzed the evolution of return on investment for five Bucharest Stock Exchange (BSE) listed companies: ALRO, AEROSTAR, ARTEGO, PETROM and TRANSELECTRICA, using an econometric model, with biannual data for the 2004-2011 period. We have looked to select various, yet significant companies from different sectors in order to get a representative sample.

In the second section of the paper we have realized a literature review concerning the approach of ROI in reference articles and books during the last 15 years; the third section is dedicated to the specific analysis of ROI for the sample of five Romanian companies, whereas the final section deals with the concluding remarks and possibilities for improving the analysis.

2. Literature review

Similar studies were done by economists all over the world with the purpose of testing the factors with a direct influence upon the profitability ratios of the companies, based on the data displayed in their published financial situations.

ROI was the focus of the study realized by Johanson and Yip in 1994, which concerned American and Japanese companies. (Gujarati, 2011) Busija *et. al* have used, in a 1997 study, ROI as a starting point in the analysis of the economic and financial performances of the companies. (Billett, Garfinkel, Jiang, 2011) Similarly, Dess *et. al* have used the same ratio in the analysis of the entrepreneurial strategies and of the performances registered by the companies. (Butler, Cornaggia, Grullon, Weston, 2011) Philips (1997) has dedicated an entire volume to the analysis of the ROI in its capacity as an economic performance measure. (Hirth, Viswanatha, 2011) Zajac *et al.* (2000) have used the return on assets (ROA) in the analysis of the strategies deployed by the companies in this sense. (Johansson, Yip, 1994) Delios and Beamish have analyzed a series of Japanese companies based on the return on equity (ROE). (Busija, O'Neill, Zeithaml, 1997) Erdogmus *et al.* (2004) have analyzed the use of return on investment in the software industry. The authors state that ROI calculation organizes a project's costs and benefits into a useful profitability measure. On the other hand they maintain that this measure alone doesn't capture two essential ingredients of a serious economic analysis: time and risk. (Dess, Lumpkin, Covin, 1997) Mulyono and Khairurizka, from the Depok University of Indonesia, have realized a similar study in 2009 intending to demonstrate the relevance of the accounting information in explaining the evolution of the shares of stock in the capital market. Their study was based on data from 39 Indonesian companies, analyzed on a quarterly basis for the 2002-2006 period. (Harris, Tzavalis, 1999) Almeida, Campello and Weisbach (2011) have studied corporate investment policies and their efficiency under not frictionless financing conditions [ ]. The authors have demonstrated how future financing constraints lead firms to favor investments with shorter payback periods, investments with less risk, that use more pledgeable assets. Morellec and Schurhoff (2011) have analyzed corporate investment and financing under as asymmetric information. [ ] They have shown that asymmetric information induces firms with good prospects to speed up investment, leading to a significant erosion of the option value of waiting to invest, as they can credibly signal outside investors using the timing of corporate actions and their debt-equity mix.

Hirth and Viswanatha (2011) have approached the relation between financing constraints, cash-flow risk and corporate investment. They concluded that low cash firms facing financing costs today are more reluctant to invest if they have less cash, or if their future cash flows are more risky. In the same time, cash-plentiful firms facing no financing costs today invest in less favorable projects (foregoing their real option to wait) if they have less cash, or if their future cash flows are more risky.

Gomes and Schmid (2010) studied the relationship between financial leverage and stock returns in a dynamic world where both corporate investment and financing decisions are endogenous. []. They have found that in the presence of financial market imperfections, leverage and investment are usually correlated such as highly levered firms are mature firms with relatively safer book assets and fewer riskier growth opportunities.

Firth *et al.* (2012) have researched corporate investment and their efficiency considering government control and the financing channels for a panel made of listed companies from China. [ ]. They discovered that government controlled listed firms have greater investment–cash flow sensitivities compared to privately controlled listed companies. Still, the difference in sensitivities appears only for the companies having fewer profitable investment opportunities.

Billett, Garfinkel and Jiang (2011) have analyzed the influence of good governance on investment. Their results pointed out that higher investment hazard firms display significantly negative long-run operating and stock performance, supporting the theory according to which poor governance associates with overinvestment.

Butler *et al*. (2011) approached the relation between real investment, corporate financing decisions and managerial market timing. They have proven that for the aggregate level the amount of

new financing is more important for future market returns than its composition. They have also concluded that measures of real investment are correlated with future returns, whereas measures of managerial market timing are not.

3. The analysis of return on investments

We propose the analysis of the return on investment (ROI) for five companies listed at the BSE: ALRO, AEROSTAR, ARTEGO, PETROM and TRANSELECTRICA, using an econometric model.

In the practice of the financial analysis ROI can be approached in two formats, depending upon the financial or economic perspective followed by the analysts. In the *financial perspective*, ROI relates to the capital invested by shareholders and financial creditors (banks, bondholders, leasing institutions and others alike). In this approach ROI is also known as RONA (return on net assets). In the *economic approach*, ROI is concerned with the newly created fixed, respectively current assets, usually financed by the financial investors (shareholders and financial creditors). In an even more conservative approach, as the case with our study, ROI deals only with the yearly increase of the fixed assets' stock (the so-called classic definition of investments).

Also, the return on assets measure (ROA), can be considered an economic form of ROI, where the investment are represented by the total assets of the company, or the total capital invested by shareholders, financial and operating creditors (such as suppliers, employees and different public authorities).

We can represent the situation in Figure 1 below.

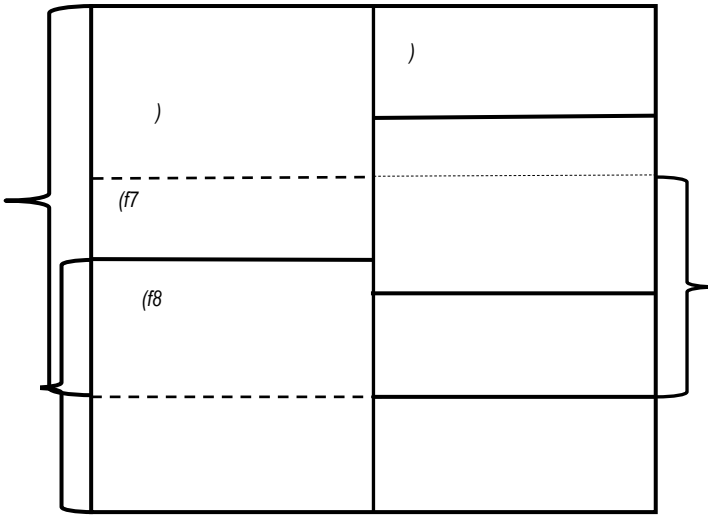

Figure 1. The financial representation of the balance sheet

The new investments of the year, pictured on the right side of figure 1 represent the investment in fixed assets and the increase in net working capital (the investment in current assets for that year).

Based on the financial approach of the balance sheet we can determine another measure of the efficiency of investments, respectively the specific investment needed to obtain 1000 lei of net operating profit after taxes (NOPAT):

$$Specific\ investment = \frac{Total\ assets (or\ Total\ net\ assets)}{Net\ operating\ profit\ after\ taxes} \times 1000$$

For example, in case of ALRO, for the second semester of 2006, the level of the specific investment in total assets is of 20,220 lei, respectively the company needed assets worth of 20,220 lei to generate 1,000 lei of net operating profit after taxes. Even supposing that the company has an overall average cost of capital of merely 5% for that semester, it still results that it has to sustain costs with dividends and interest toward its financial investors of 1,011 lei to generate an operating profit of 1,000 lei.

In our analysis we are analyzing the efficiency of the investments made by the fore-mentioned companies using the return on investment (ROI) measure. We determine ROI as a ratio between NOPAT of the year and the average investment for that year:

$$ROI = \frac{Net\ operating\ profit\ after\ taxes(NOPAT)}{Average\ investment\ in\ fixed\ assets(\overline{Inv})} \times 100$$

The yearly investment for year *n* is estimated using a marginal approach, comparing the effective fixed assets of the *n* year with the figure for the fixed for the *n* year should the company made no investment during the *n* year, as follows:

$$Investment_{n\ year} =$$
$$= Fixed\ assets_{n\ year} - (Fixed\ assets_{n-1\ year} - Depreciation_{n-1\ year})$$

Obviously this is just an approximation of the yearly investment and it raises timing problems, but in absence of any published data it may the best course of action.

The average investment for year *n* is calculated as the simple average between the investment of the *n* year and the investment of the *n-1* year.

For our analysis we have used biannual data for the 2004-2011 period, with 16 observations for each company mentioned. We expect that the reduced number of observations will determine the number of variables likely to significantly influence the dependent variable as well as the connections with the dependent variable. We have used panel data, for which each value is defined by two marks, one pertaining to the time dimension, where the other is referring to the identification of the statistical unit. We mention that the data from our model constitute a balanced panel, as we have used biannual data for all the years and all the companies (Drukker, 2003).

The model we propose is:

$$roi_{it} = \propto + \beta_1 ccc_{it} + \beta_2 cl_{it} + \beta_3 rl_{it} + \beta_4 sk_{it} + \beta_5 ebit_{it} + \beta_6 \Delta st_{it} + \beta_7 ta_{it} + \beta_8 btm_{it} + \beta_9 roa_{it} + \mu_i + \nu_t + \varepsilon_{it}$$

where:

α – the free term of the regression curve;
β_1 to β_9 – the regression coefficients;
i – denotes the company;
t – represents the year;
ccc – the cash conversion cycle in days;
cl – current liquidity;
rl – reduced liquidity;
sk – the structure of the capital (the medium and long term debt ratio);
ebit – Earnings before the deduction of interest and taxes;
Δst – the relative modification of the sales turnover;
ta – total assets;
btm – book to market value ratio;
roa – return on total assets of the company;
μ_i – fixed effects for the companies;
ν_t – fixed time effects;
ε_{it} – the error term.

The panel data can be analyzed using a fixed or random effects model. In order to decide upon the most appropriate model we have tested with the Hausman test, the type of approach suitable for the analysis of our panel data.

As Prob>chi2 = 0.0389, which is obviously below 0.05, we can deduct that our panel data are suitable for a fixed effects model, similarly to the Höbarth's study from 2006.

In what follows we have realized a series of tests upon the panel data. The first test referred to the verification of the heteroscedasticity, using the modified Wald test (Baum, 2001). As a result, we have rejected H_0 and we adopt the H_1 hypothesis, hence the variance of the errors is not constant. Generally,

the incompliance of the homoscedasticity hypothesis of the residues is based on two categories of factors: the erroneous specifying of the regression model or the nature of the studied phenomena.

Where heteroscedasticity is concerned the standard errors are displaced and we can consider different methods in order to correct its effects. The most suitable are the reformulating of the model or the utilization of the robust error model. For our present work we have decided to apply the robust errors regression model.

In the same time we have verified the autocorrelation of the errors, as its existence leads to smaller standard errors and to a higher determination coefficient.

We have continued with the Wooldridge test of the autocorrelation of the residues for the panel data models. This involves a Wald test in which the null hypothesis states that there is no first order autocorrelation (Hoechle, 2007). The results obtained denies the presence of the first order autocorrelation as Prob>F= 0.0827 < 0.1, hence the errors are not correlated (Delios, Beamish, 2000).

As the data available for our study constitute a micro-panel of data the cross-sectional errors dependence and stationarity tests are not compulsory (Höbarth, 2006).

We have decided nevertheless to analyze the cross-section dependence using the Breusch-Pagan LM independence test. The starting hypothesis states that the residues are not correlated between the entities. The results have shown the cross-sectional residues are not correlated, which was also confirmed by the Pesaran test.

As a conclusion, according to the results from these tests we do not have cross-sectional dependence. Should the residues have been correlated we would have to use the Driscoll-Kraay type errors' regression (Gomes, Schmid, 2010).

Also, we have included dummy variables for the correction of the abnormal values and for the inclusion of qualitative variables. We intended to capture the specific time effects due to biannual financial reporting used, as well as specific effects at the level of each company, such as restructuring, strikes and other specific elements in the activity of the companies.

The program used for data processing, STATA, makes allowances in this sense and has the option of an automatic insertion of both time and specific dummy variables (dummy variables pertaining to the analyzed entities). We have tested the opportunity of including the fixed time effects, respectively the dummy variables pertaining to analyzed semesters (Höbarth, 2006). The results indicated that we can reject *Ho* according to which all the coefficients of the dummy time variables are equal to zero, as Prob>F = 0.0646, in fact lower than the 0.1 threshold. We can conclude that we need to use dummy time variables.

We have continued with running the fixed effects, robust errors and dummy variables regression in order to express the relationships existing between the endogenous variable (ROI) and the 9 exogenous variables. The results are displayed in Table 1 below:

Table 1 - The regression with 9 variables, fixed effects, robust errors

Explanatory variables	Coefficients	Robust standard errors	p-value
ccc	-0.0650***	(0.0186)	0.001
cl	0.2453	(0.7593)	0.748
rl	-0.1051	(0.7748)	0.893
sk	16.8037***	(5.9396)	0.007
ebit	3.34e-10	(2.63e-10)	0.212
Δst	2.2817**	(1.0925)	0.043
ta	-2.39e-10***	(9.45e-11)	0.016
btm	-0.0422	(0.2170)	0.847
roa	5.9026**	(2.7396)	0.037
Dummies for companies	Annulled (4)		
Dummies for years	Included (14) Biannual 2005-2011		
_cons	0.1145		
N	68		

	F(23,40) 3.79
Prob>F	0.0001
R^2	76.28%

Source: data collected and processed by the authors with STATA
*Note: ROI is the dependent variable. The significance threshold is presented as ** 5%, ***1%.*

The total number of observations was 68, with biannual data for each of the five companies, for the 2004-2011 period. The determination coefficient, R^2, expresses the percentage of the total modification of ROI which is explained by the chosen independent variables. In effect, 76.28% of the evolution of this ratio is explained by the influence of the 9 exogenous variables included in this model (Johansson, Yip, 1994).

The Fisher test analyzes the hypothesis of simultaneously having all the coefficients of the regression equation's slope equal to zero, or the independent variables not to influence in any way the evolution of ROI. We need to determine the *calculated F* and compare it with the *table given F*. If *calculated F > table given F* we can reject the null hypothesis.

For the STATA program this hypothesis is rejected if the value Prob>F is very close to zero, in our case 0.0001 (Drukker, 2003). Prob>F expresses the critical probability of the test, respectively if this value is lower than 0.05 we can abandon the hypothesis of the lack of significance for the independent variables in favor of the hypothesis of having a significant regression model (Johansson, Yip, 1994).

The result showed we can reject the null hypothesis and hereby we have concluded that at least one regressor of the nine included is statistically significant and the model is well built.

Another aspect of the regression table is referring to the *p* value for each independent value, presented in the third column of the table no. 1 before. This shows if the respective variable affects or not the evolution of the dependent variable. The significance threshold is usually set at 0.05. Hence, if the values of *p* for any given variable are lower than this threshold it means that the respective variable really influences ROI (Johansson, Yip, 1994).

In the same time we have to mention that there are articles and works published which retain all the variables whose significance threshold is below 10%, instead of the more usual 5% one (Firth, Malatesta, Xin, Xu, 2012).

Based on the results obtained we can notice that four of the nine variables do not actually influence ROI: current liquidity, reduced liquidity, EBIT and book to market value, as their *p>0.05*. In the same time, by analyzing the coefficient for total assets, of $-2.39e^{-10}$, we can notice it is insignificantly statistically different from zero. This fact determined us to drop the variable, even its significance threshold is 1%.

By comparison, the Höbarth's study revealed that current liquidity negatively influences ROI. The aforementioned paper concluded that a 1% decrease of the current liquidity will determine a 0.37*pp* increase of ROI. Similarly, the book to market ratio presents a negative influence in Höbarth's study. He found that a 1*pp* decrease in the level of this measure will determine a 0.145*pp* increase of the ROI, the book to market ratio having a 1% significance threshold.

In the initial model we have included a series of dummy variables in order to capture the specific time effects due to biannual reporting, as well as specific effects at the level of each company, such as economic changes or shocks. We can notice that the dummy variables related to capturing the companies' effects were dropped by the program as they were not statistically significant. The program kept only the time dummy variables due to biannual reporting.

Further we have run the regression model using only the four variables proven to exert a significant influence upon ROI, respectively the cash conversion cycle, the structure of the capital, the modification of sales turnover and ROA. The results obtained were synthesized in Table 2 below.

Table 2. The fixed effects and robust errors regression with four variables

Explanatory variables	Coefficients	Robust standard errors	p-value
ccc	-0.0501 ***	(0.016)	0.004
sk	6.7466	(3.99)	0.098
Δst	2.0639 ***	(1.092)	0.065
roa	4.5262	(2.215)	0.046
Dummies for companies	Canceled (4)		
Dummies for years	Included (14) - biannual 2005-2011		
_cons	-0.03		
N	74		
F(18,51)	2.99		
Prob > F	0.0011		
R^2	65.55%		

Source: data collected and processed by the authors with STATA
*Note: ROI is the dependent variable. The significance threshold is presented as ** 5%, ***1%.*

We can see that 65.55% of the variation of ROI is explained by the four variables. In the same time, the model is statistically significant as the *p* value associated to F is of 0.0011≈0. We also notice that following this regression, the significance threshold for the structure of capital goes over the critical level of 0.05, respectively 0.098. The robust standard error associated to this measure is quite high, of about 4. The standard errors represent the standard deviation of the estimators and shows how much the estimated values of the coefficients related to the parameters that they are estimating are varying, in average, in plus or in minus. Hence, we will run again the regression using only the cash conversion cycle, the relative modification of the sales turnover and ROA as explanatory variables (see table no. 3 below).

Table no. 3. The fixed effects and robust errors regression with three variables

Explanatory variables	Coefficients	Robust standard errors	p-value
ccc	-0.0458 ***	(0.015)	0.005
Δst	2.4761 **	(1.123)	0.032
roa	4.5788**	(2.191)	0.042
Dummies for companies	Annulled (4)		
Dummies for years	Included (14) Biannually for 2005-2011		
_cons	0.41		
N	74		
F(17,52)	2.77		
Prob > F	0.0025		
R^2	62.47%		

Source: data collected and processed by the authors with STATA
*Note: ROI is the dependent variable. The significance threshold is presented as ** 5%, ***1%.*

Analyzing the results obtained we can conclude that the model is statistically significant as the *p* value is 0.0025≈0. The cash conversion cycle, the modification of the sales turnover and ROA determine about 62% of the evolution of ROI.

The model becomes:

$$\boldsymbol{roi_{it} = 0.41 - 0.0458ccc_{it} + 2.4761\Delta st_{it} + 4.5788roa_{it} + \nu_t + \varepsilon_{it}}$$

We can notice that the cash conversion cycle exerts a negative influence upon the evolution of ROI, with a significance threshold of 1%. It means that we expect ROI to increase by 0.0458*pp* at a decrease by 1 day of the cash conversion cycle. A more subtle interpretation compares two companies

which display the same values for all the explanatory variables, but have a cash conversion cycle that differs by 1 day. Under these circumstances we would expect the company with a shorter cash conversion cycle to have a ROI 0.0458*pp* higher than the other company. The interpretation is similar for the relative modification of the sales turnover: a 1% increase in sales turnover might lead to a 2.4761*pp* increase in the level of ROI (Johansson, Yip, 1994).

The data series of the exogenous variable and of the three explanatory variables were tested in view of analyzing the stationarity based on the Harris-Tzavalis test, recommended for short term panel data. The results confirmed the stationarity for the series of the dependent variable and that of the cash conversion cycle. Regarding the two other measures the test could not be realized as we are missing values for the first semester of 2005 (Erdogmus, Favaro and Strigel, 2004).

In a similar way the Höbarth's study revealed a negative influence of the cash conversion cycle upon ROI with a significance threshold of 10%, indicating that a decrease by 0.2 days of the cash conversion cycle will induce a 1*pp* increase in the level of ROI.

In the same time the Höbarth's work concluded, with a 1% significance threshold that ROI is directly influenced by ROA. The author has shown that a 1*pp* increase of ROA will induce a 1.55*pp* increase in ROI.

Given the determinants of the cash conversion cycle we have intended to determine the effective impact of each element, respectively the inventory conversion period (*icp*), the receivables conversion period (*rcp*) and the payables deferral period (*pdp*) as in Table 4 below.

Table 4. The regression with the determinants of the cash conversion cycle

Explanatory variables	Coefficients	Robust standard errors	p-value
icp	-0.0575 ***	(0.014)	0.000
rcp	-0.0462 **	(0.020)	0.026
pdp	0.0395**	(0.017)	0.026
Δst	2.3778 **	(1.145)	0.043
roa	4.4493**	(2.188)	0.047
Dummies for companies	Annulled (4)		
Dummies for years	Included (14)		
_cons	0.9622		
N	75		
F(19,50)	3.76		
Prob > F	0.0001		
R^2	64.01%		

Source: data collected and processed by the author with STATA
*Note: ROI is the dependent variable. The significance threshold is presented as ** 5%, ***1%.*

As such, the model becomes:

$$roi_{it} = 0.9622 - 0.0575icp_{it} - 0.0462rcp_{it} + 0.0395pdp_{it} + 2.3778\Delta st_{it} + 4.4493roa_{it} + v_t + \varepsilon_{it}$$

As expected, given the determinants of the cash conversion cycle, all the variables concerned influence ROI, as the p value is 0.0001≈0. More of it, R2 increased from 62.47% to 64.01%, offering a better fit of the model in this case compared to the indiscriminate expression of the cash conversion cycle.

It means that the five variables account for approximately 64% of the variation of the dependent variable. An increase in the inventory conversion period by 1 day will determine a 0.05pp decrease in the ROI. Also we expect a company with a higher payables deferral period (even by just one day) to have a 0.0395pp higher ROI compared to a company with a lesser pdp.

Similarly to the previous situation, the series for the inventory conversion period, receivables conversion period and the payables deferral period were subjected to the Harris-Tzavalis test, which revealed that all three of them are stationary.

Concluding remarks

The analysis of the economic performances based on regression models reveals interesting facts about the causality relations between ROI and significant variables generated by the operating and investing cycles of the companies.

We have started with nine explanatory variables and after subsequent successive works done with STATA we have reached the final model with three variables and one time dummy variable. These variables explained about 62% of the evolution of ROI. Further we managed to enhance the significance of the model to 64% by taking into account the components of the cash conversion cycle: the inventories conversion period, the receivables conversion period and the payables deferral period.

Our analysis can be improved if we manage to increase the number of companies involved and the number of years, which will also allow identifying more factors of influence and a more complex causality.

One variation of the analysis can be achieved when using the measure specific investment, respectively the level of the assets needed for generating 1000 lei of net operating profit after taxes. This measure offers the advantage of having a financial approach toward the efficiency of the investments.

In the same time, in order to increase the accuracy of the data we could use cash flow measures (operating cash flow, free cash flow to the firm), and value based measures. For example, we could replace ROI with CFROI (cash flow return on investments) or with economic profit (also known as EVA – economic value added). However a problem with value based measures is that they are more difficult to calculate and the benefits from increased accuracy compared to the more traditional measures are not always significant enough to justify their use.

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REPRESENTATION OF EQUIVALENT ELEMENTARY STRUCTURED ELEMENTS

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Abstract:
The concept of structured elements in labeled graphs was introduced in ([1]). In the present paper we will extend the terms of structured element and elementary structured element by introducing the notion of equivalent elementary structured element. Also, we will define some equivalence relations and the term of equivalence class designated by an element.

Keywords: frontier tracing, equivalence relation, equivalence class

1. Introduction

An important concept in the field of Artificial Intelligence was named Knowledge Representation and Reasoning System (KRRS). Such a system is a collection of components cooperating between them and the whole system is able to reason in order to give the answer of an interrogation (Wagner, 1994). Each knowledge base uses a knowledge representation method. The knowledge representation can be classified in two main categories: the logical representation and the graph-based representation of knowledge. In a graph-based representation an entity is given by a pair of nodes and a link between them. The semantics is given by specifying the concrete meaning of this notational convention. In this category belongs the method of labeled stratified graphs (Țăndăreanu, 2003), (Țăndăreanu, 2004), (Țăndăreanu, 2004). A labeled graph is a tuple G = (S, L_0, T_0, f_0), where S is a finite set of nodes (each node is represented by a rectangle), L_0 is a set of elements named labels, T_0 is a set of binary relations on S and f_0: $L_0 \rightarrow T_0$ is a surjective function. The graphical representation of G shows that from node x_i to node x_{i+1} we draw an oriented arc, labeled by the symbol a_i. Because two nodes can be connected by multiple arcs, a path is regarded as a pair d = ((x_1,… x_{n+1}), [a_1,… a_n]), where x_1, …, $x_n \in$ S and a_1, …, $a_n \in L_0$ for all $i \in \{1, \ldots, n\}$. We denote by *Path*(G) the set of all paths of G.

In (Țăndăreanu, Dincă. 2012) we define the set STR(G) = $\bigcup_{d \in Path(G)} STR(d)$. Each element of this set is named *structured path* of G.

If d = ((x_1,… x_{n+1}), [a_1,… a_n]) is a path in G, for $1 \le i < j \le n+1$, the length of path ([x_i,…,x_j], [a_i,…, a_j]) is denote by *length*(x_i, x_j) = j – i. For every node *x* of d the successor of order *k* is denote by $succ^{(k)}(x)$. Frequently we shall use the shorter notation succ*(x)* instead of $succ^{(1)}(x)$.

2. Equivalent elementary structured elements

Let us consider a labeled graph G and *d* a path in G.

d = ([x_1, ..., x_{n+1}], [a_1, ..., a_n]).

An *structured element* for *d* is the entity ((*x*, *y*), [*1*, s_1, s_2, ..., s_p]). A pair of the form ((x_i, x_{i+1}), [*s*]), where $1 \le s \le n+1-i$ and $i \in \{1, ..., n\}$ is an *elementary structured element* for *d*.

We denote by X(d) the set of structured elements for d. In [1] we have defined the term of conditional membership such: ((x, y), [s]) ϵ_c X(d) if ((x, y), [s]) $\in$ X(d) or there is a structured element $\alpha \in$ X(d) such that ((x, y), [s]) $\in \alpha$.

From the definition of accepted set [1] we know that for each elementary structured element ((x, y), [s]) ϵ_c X(d) there are ((*x*, *y*), [*k*]) ϵ_c X(d) and ((*u*, *v*), [*s-k*]) ϵ_c X(d), uniquely determined, such that $u = succ^{(k)}(x)$ and $v = succ^{(k)}(y)$. The uniqueness of these elements allows us to represent this property by means of a particular tree such that:

- the root is labeled by ((*x*, *y*), [*s*]) and the root has two direct descendants;
- the left direct descendant is labeled by ((*x*, *y*), [*k*]);
- the right direct descendant is labeled by ((*u*, *v*), [*s-k*]).

This tree is drawn in Figure 1.

We can repeat this procedure for the direct descendants until the leaves are elements of the form ((α, β), [1]).

If X(d) is an accepted set of structured elements for some labeled path, a **tree over** X(d) is a binary tree *t* satisfying two conditions:

- the node of *t* is labeled by elementary structured elements of X(d)
- if some node of *t* is labeled by ((*x*, *y*), [*s*]) ϵ_c X(d) and $k = K_x^{(s)}$ then the left descendant is labeled by ((*x*, *y*), [*k*]) ϵ_c X(d) and the right descendant is labeled by ((*succ*$^{(k)}$(*x*), *succ*$^{(k)}$(*y*)), [*s*-*k*]) ϵ_c X(d) .

The *set of all trees over* X is denoted by TREE(X). Their leaves are labeled by elements of the form ((α, β), [1]).

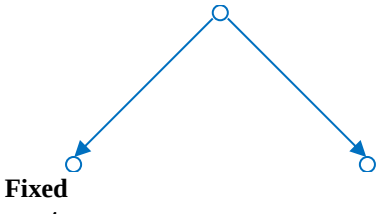

Figure 1 - A general representation for a tree

Let us consider the trees:

t_1 = *tree*((*x*, *succ*(*x*)),[*s*]) ϵ *TREE*(X)

t_2 = *tree*((*y*, *succ*(*y*)),[*s*]) ϵ *TREE*(X)

such that *s* ϵ *Ind*(X) \{1}. We shall write *Sub*(t_1, *y*) = t_2 if substituting *x* by *y* in t_1 we obtain t_2.

Example 1:

Let us consider a partial path of *d*:

Figure 2 – Partial path of d

We choose t_1 = *tree*((*x*$_1$, *x*$_2$),[2]) and t_2= *tree*((*x*$_3$, *x*$_4$),[2]). We replace x_1 with x_3 in t_1, and we obtain:

Sub(t_1, *x*$_3$) = *tree*((*x*$_3$, *succ*(*x*$_3$)),[2]) = *tree*((*x*$_3$, *x*$_4$),[2]) = t_2

If t ϵ *TREE*(X) and

front(t) = ((x_i, x_{i+1}),[1])…((x_{i+k}, x_{i+k+1}),[1]) then we define the "*frontier tracing*" of t by *tr*(*front*(t)) = g(x_i, x_{i+1})…g(x_{i+k}, x_{i+k+1}).

By g(x_i, x_{i+1}) we understand the label of the arc that connects x_i with x_{i+1}.

Definition 1. If we consider *s* ϵ *Ind*(X) \{1} and the elements:

t_1 = *tree*((*x*, *succ*(*x*)),[*s*]) ϵ *TREE*(X)

t_2 = *tree*((*y*, *succ*(*y*)),[*s*]) ϵ *TREE*(X),

then we write $t_1 \approx t_2$ if *Sub*(t_1, *y*) = t_2 and *tr*(*front*(t_1)) = *tr*(*front*(t_2)).

Proposition 1. The relation ≈ is an equivalence relation on *TREE*(X).

Proof. An equivalence relation is a binary relation on a set, that satisfies the following properties:

1. Reflexivity

$\forall t_1 \in TREE(X), \quad t_1 \approx t_1$

If t_1 = *tree*((*x*, *succ*(*x*)),[*s*]) ϵ *TREE*(X)

Sub(t_1, *x*) = t_1

tr(*front*(t_1)) = *tr*(*front*(t_1)) $\Rightarrow t_1 \approx t_1$

2. Symmetry

$\forall t_1, t_2 \in TREE(X), t_1 \approx t_2 \Rightarrow t_2 \approx t_1$
$t_1 = tree((x, succ(x)),[s]) \in TREE(X)$
$t_2 = tree((y, succ(y)),[s]) \in TREE(X)$,

$$t_1 \approx t_2 \Rightarrow \begin{cases} Sub(t_1, y) = t_2 \\ tr(front(t_1)) = tr(front(t_2)) \Rightarrow tr(front(t_2)) = tr(front(t_1)) \end{cases} \quad (1)$$

$Sub(t_1, y) = t_2 \Rightarrow Sub(t_2, x) = t_1$ (2)
From (1) and (2) $\Rightarrow t_2 \approx t_1$

3. Transitivity

$\forall t_1, t_2, t_3 \in TREE(X)$
$t_1 \approx t_2$ and $t_2 \approx t_3 \Rightarrow t_1 \approx t_3$
If $t_1 = tree((x, succ(x)),[s]) \in TREE(X)$
$t_2 = tree((y, succ(y)),[s]) \in TREE(X)$
$t_3 = tree((z, succ(z)),[s]) \in TREE(X)$

$$t_1 \approx t_2 \Rightarrow \begin{cases} Sub(t_1, y) = t_2 \\ tr(front(t_1)) = tr(front(t_2)) \end{cases}$$

$$t_2 \approx t_3 \Rightarrow \begin{cases} Sub(t_2, z) = t_3 & (3) \\ tr(front(t_2)) = tr(front(t_3)) & (4) \end{cases}$$

From (2) and (4) $\Rightarrow tr(front(t_1)) = tr(front(t_2))$ (5)
$Sub(t_2, z) = Sub(Sub(t_1, y), z) = t_3$ (6)
From (5) and (6) $\Rightarrow t_1 \approx t_3$

Definition 2. We define the following relation on X:

$((x, succ(x)),[1]) \sim ((y, succ(y),[1])$ if $g(x, succ(x)) = g(y, succ(y))$
for $s \geq 2$, $((x, succ(x)),[s]) \sim ((y, succ(y)),[s])$ if
$tree((x, succ(x)),[s]) \approx tree((y, succ(y)),[s])$.

Proposition 2. The relation ~ is an equivalence relation on X.

Proof. An equivalence relation is a binary relation on a set, that satisfies the following properties:

1. Reflexivity

$\forall t_1 \in TREE(X)$, $t_1 \sim t_1$
If $t_1 = tree((x, succ(x)),[s]) \in TREE(X)$
$t_1 \approx t_1 \Rightarrow t_1 \sim t_1$

2. Symmetry

$\forall t_1, t_2 \in TREE(X)$, $t_1 \sim t_2 \Rightarrow t_2 \sim t_1$
If $t_1 = tree((x, succ(x)),[s]) \in TREE(X)$
$t_2 = tree((y, succ(y)),[s]) \in TREE(X)$
$t_1 \sim t_2 \Rightarrow t_1 \approx t_2$.
But "≈" is an equivalence relation, so if $t_1 \approx t_2 \Rightarrow t_2 \approx t_1 \Rightarrow t_2 \sim t_1$

3. Transitivity

$\forall t_1, t_2, t_3 \in TREE(X)$
$t_1 \sim t_2$ and $t_2 \sim t_3 \Rightarrow t_1 \sim t_3$
$t_1 \sim t_2 \Rightarrow t_1 \approx t_2$

$t_2 \sim t_3 \Rightarrow t_2 \approx t_3$
The relation "≈" is an equivalence relation + (1) + (2) $\Rightarrow t_1 \approx t_3 \Rightarrow t_1 \sim t_3$
An useful property of the equivalence relation ~ is specified in the next proposition.

Proposition 3. Let be $((\alpha, succ(\alpha)),[s]) \in_c X$ and $((x, succ(x)),[s]) \in_c X$, where $s \geq 2$. Then
$((\alpha, succ(\alpha)),[s]) \sim ((x, succ(x)),[s])$
if and only if the following conditions are satisfied:

$$K_\alpha^{(s)} = K_x^{(s)} \quad (2.2)$$

$((\alpha, succ(\alpha)),[k]) \sim ((x, succ(x)),[k])$ (2.3)
$((succ^{(k)}(\alpha), succ^{(k+1)}(\alpha)),[s\text{-}k]) \sim ((succ^{(k)}(x), succ^{(k+1)}(x)),[s\text{-}k])$ (2.4)
Proof. For an arbitrary element $((y, succ(y)),[p]) \in_c X$ we denote
$t_{y,p} = tree((y, succ(y)),[p])$.
Suppose (2.1) is true. Using the definition of the relation ~ we obtain:
$t_{\alpha,s} \approx t_{x,s}$ (2.5)
therefore
$Sub(t_{\alpha,s}, x) = t_{x,s}$ (2.6)
$tr(front(t_{\alpha,s})) = tr(front(t_{x,s}))$ (2.7)
From (2.6) we deduce (2.2) and
$Sub(t_{\alpha,k}, x) = t_{x,k}$ (2.8)
$Sub(t_{succ(k)(\alpha),s\text{-}k}, x) = t_{succ(k)(x),s\text{-}k}$ (2.9)
But we have
$front(t_{\alpha,s}) = front(t_{\alpha,k}).front(t_{succ(k)(\alpha),s\text{-}k})$
$front(t_{x,s}) = front(t_{x,k}).front(t_{succ(k)(x),s\text{-}k})$
therefore from (2.7) we obtain
$tr(front(t_{\alpha,k})) = tr(front(t_{x,k}))$ (2.10)
$tr(front(t_{succ(k)(\alpha),s\text{-}k})) = tr(front(t_{succ(k)(x),s\text{-}k}))$ (2.11)

Now, from (2.8) and (2.10) we obtain (2.3) and similarly from (2.9) and (2.11) we obtain (2.4). Conversely, suppose (2.2), (2.3) and (2.4). But (2.3) implies (2.8) and (2.10). Similarly, (2.4) implies (2.9) and (2.11). Taking into account (2.2) we have (2.6) and (2.7), therefore (2.5). B ut (2.5) shows that (2.1) is true.

Definition 3. For any element $((x, succ(x)), [s]) \in_c X$ we shall denote by $[x,s]_\sim$ the equivalence class designated by this element.
In these terms the previous proposition can be restarted as follows:

Proposition 4. Let be $((\alpha,succ(\alpha)), [s]) \in_c X$ and $((x,succ(x)) ,[s]) \in_c X$, where $s \geq 2$. Then $[\alpha,s]_\sim = [x,s]_\sim$ if and only if:

$$K_\alpha^{(s)} = K_x^{(s)}$$

$[\alpha,k]_\sim = [x,k]_\sim$
$[succ^{(k)}(\alpha),s\text{-}k]_\sim = [succ^{(k)}(x),s\text{-}k]_\sim$
The next exemple gives several intuitive aspects concerning the equivalence classes.

Exemple 2. We consider the path $d = ([x_1, \ldots, x_9], [a, b, c, c, a, b, c, c])$ represented in Figure 3 and the following accepted set
$X = \{((x_1,x_2), [1, 2, 3, 4, 7, 8]), ((x_5, x_6), [1, 2, 3])\} \cup \{((x_i, x_{i+1}), [1])\}_{i=\{2, 3, 4, 6, 7, 8\}}$.

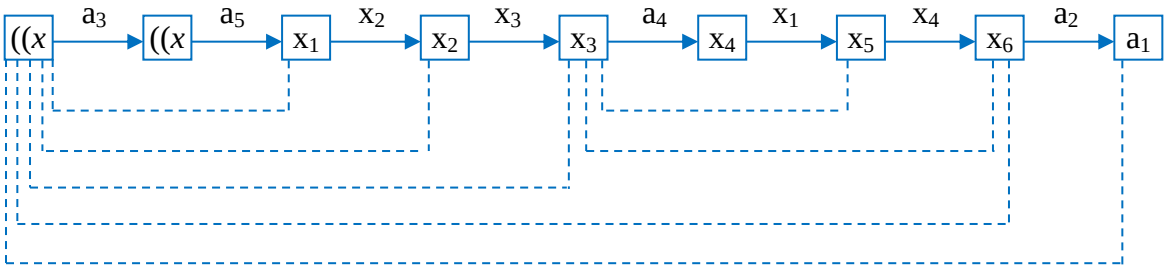

Figure 3 – Intuitive representation of *X* for Example

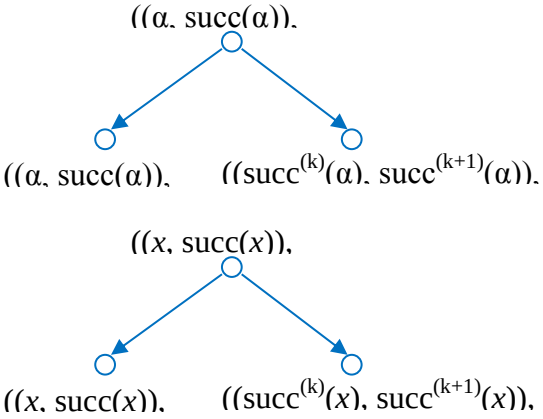

Figure 4 – ((α, succ(α)), [s]) ~ ((*x*, succ(*x*), [s])

The intuitive meaning of *Definition 3*, which allows us to compute easily the elements of X/~ can be presented as follows: the roots specified in *Figure 4* are equivalent if and only if their left descendants are equivalent and their right descendants are equivalent. If we represent graphically the elements of TREE(*X*) then it is easy to find the elements of X/~. Really, applying the intuitive representation of *Figure 4* from leaves to the root of an element of TREE(*X*) we compute the equivalence classes. Thus, for the set *X* considered in *Exemple 2*, the elements of TREE(*X*) are the tree drawn in *Figure 5* and all its subtrees. We obtain:

$[x_1, 1]_{\sim} = \{((x_1, x_2), [1]), ((x_5, x_6), [1])\} = [x_5, 1]_{\sim}$
$[x_2, 1]_{\sim} = \{((x_2, x_3), [1]), ((x_6, x_7), [1])\} = [x_6, 1]_{\sim}$
$[x_3, 1]_{\sim} = \{((x_3, x_4), [1]), ((x_4, x_5), [1]), ((x_7, x_8), [1]), ((x_8, x_9), [1])\} = [x_4, 1]_{\sim} = [x_7, 1]_{\sim} = [x_8, 1]_{\sim}$
$[x_1, 2]_{\sim} = \{((x_1, x_2), [2]), ((x_5, x_6), [2])\} = [x_5, 2]_{\sim}$
$[x_1, 3]_{\sim} = \{((x_1, x_2), [3]), ((x_5, x_6), [3])\} = [x_5, 3]_{\sim}$
$[x_1, 4]_{\sim} = \{((x_1, x_2), [4])\}$
$[x_1, 7]_{\sim} = \{((x_1, x_2), [7])\}$
$[x_1, 8]_{\sim} = \{((x_1, x_2), [8])\}$

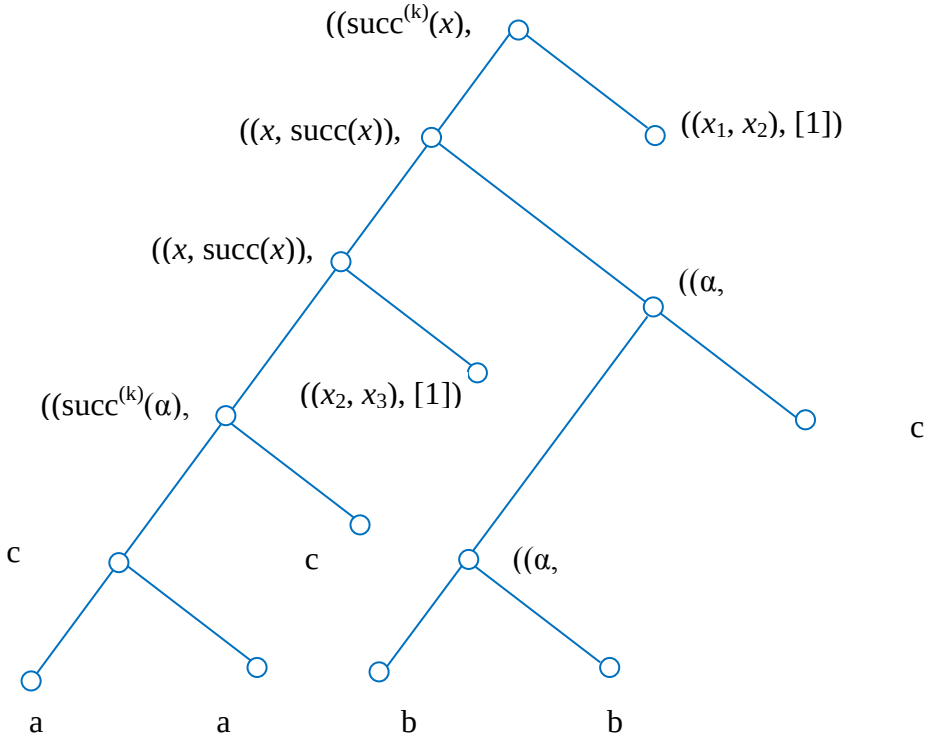

Figure 5 – TREE(X)

Conclusion

In conclusion, for a path d each element ((x, succ(x)),[s]) which belongs to a accepted set X(d) we can associate an equivalence class denote by $[x,s]_{\sim}$ designed by this element.

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EMPIRICAL STUDY ON EFFICIENT MARKET HYPOTHESIS – A CASE STUDY ON INDIAN AND PAKISTAN STOCK MARKET

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ABSTRACT

Investment in stock market is generally considered as risky but at the same time it will give very heavy return to investors. Fundamental and technical factors play a vital role in determining share price movement. In his research article 1970 Fama has brought an important concept called Efficient Market Hypothesis. In the week form it is stated that there will be a free flow of information price will adjust quickly and past cannot be taken as base for predicting the future price movement. In random walk hypothesis past price cannot be taken as a base for predicting the future. For the purpose of evaluating efficient market hypothesis with reference to BSE SENSEX and Karachi stock market run test, KS test and KPSS test were applied. It was found that random walk hypothesis is not applicable for Indian stock market whereas it holds good for Pakistani stock market.

Key words: Efficient Market Hypothesis, run test, KS test, KPSS test.

JEL Classification: G14

1. Introduction

Stock market plays a vital role in the development of Indian economy. Stock market provides an opportunity for buying and selling of securities which are listed in the stock exchanges. Share price movements are regularly monitored if there is any abnormality regulatory takes necessary steps to arrest the voliatity. It is generally stated that risk is very heavy in such investments and at the same time a return is also very heavy. Fundamental analysis and technical analysis are made before buying and selling of securities. Generally share prices move upwards and downwards depending upon positive and negative flow of information. Market may react quickly and ultimately demand and supply is the deciding factor for share price movement factor. In the year 1970 Fama developed a new concept called Efficient Market Hypothesis. As per this concept share prices move in a random manner and past price cannot be taken as a base for predicting the future price movement. As a result no single individual can make any abnormal profit. The major stock exchanges in India are the Bombay stock Exchange and National Stock Exchange and are regulated by SEBI. As regards as Pakistan there are three stock exchanges namely Karachi Stock Exchange, Islamabad Stock Exchange and Lahore Stock Exchange.

2. Literature Review

S.M.TariqZafar (2012) in his study by applying run test and correlation, he concluded that the price movement of shares of the companies in BSE SENSEX are random that is nobody can be successful in predicting the future prices on the basis of historical data only. SaqibNisar and Muhammad Hanif (2012) studied the weak form of market efficient market hypothesis of India, Pakistan, and Bangladesh and Sri Lanka stock exchanges of South Asia markets follow Random walk. MirahPutu Nikita, SubiaktoSoekarno (2012) examined Indonesia Stock Market is not efficient in a week form of market, so the investor cannot use the fair return for risk strategy. G.S. David Sam Jayakumar, Bejoy John Thomas, S. Dawood Ali (2012) showed the week form efficiency of major Indian stock market indices in BSE are not week form efficient by applying ADF test and run test. Chu V. Nguyen, Chia-Han Chang, Thai D. Nguyen (2012) pointed out Taiwan Stock Exchange reject the random walk hypothesis. Mishra P.K (2012) proved the efficiency of South Asian markets are not weak form efficient for making abnormal profit. Nikunj R. Patel, Nitesh Radadiaand Juhi Dhawan

(2012) concluded BSE, SSE, HANGSENG and NIKKEI Stock Markets are inefficient in the week form. Suresh Chandra Das & Bishnupriya Mishra (2011) reveals that Indian stock markets are in week form because of lag in information available in the stock market, the ineffective communication system and insufficient understanding of financial information by local investors. He also confirmed the week form of efficiency by applying run test. UttamSapate, Valeed Ansari (2011), tested Weak Form Market Efficiency on Bombay Stock Exchange of India concludes that the Indian stock markets are not weak form efficient and profits cannot be generated based on historical price. Rakesh Gupta, Junhao Yang (2011) Observed two major stock markets of India (NSE &BSE) both rejected the week form of efficient market for the period of 1997- 2007. Abdul Haque, Hung-Chun Liu, Fakhar-Un-Nisa (2011) tested Pakistani stock market in the week form of efficiency of weekly KSE 100 reject the random walk hypothesis i.e the market is not efficient. Jayaraman R, Ramaratnam M.S. (2011) found the selective stock market has shown efficient in the weak form, i.e. the indices move independently of each other during the successive days. Srinivasan.P (2010) suggested that the Indian stock markets does not show features of random walk theory and as such are not efficient in the weak form suggesting that stock prices remain predictable. Gagan Deep Sharma, MandeepMahendru (2009) oBSErved that investor cannot makre abnormal by using past share price movement. Abraham, Fazal J.Seyyed, Sulaiman A. Alsakran (2002) tested week form efficiency for the Gulf markets using variance ratio and run test were found that the market does not chase random walk hypothesis.

3. Statement of the problem

As per efficient market hypothesis prices will adjust immediately after the flow of information. The information may be positive or negative. For example dividend declaration, bonus shares, right issues, etc. are to be considered as positive information and market will react favourably. On the other hand in case of merger and acquisition, cancellation of order, etc market may react negatively. The information flow should reach all segments of the market participants, so that price will adjust accordingly. SEBI will watch if there is any price rigging or any manipulation of shares SEBI will also monitor sudden spurt in the volume of shares. In technical analyses we always considered past as base for predicating the future price movement. According to Fama in weak form of efficient market hypothesis past price cannot be taken as base for predicting the future price which are independent and investor cannot make abnormal profit.

Objective of the study

- To find whether the successive changes in the share price movement are independent or not.
- To test the stock market efficiency at the weak form.
- To study the series are stationary or not.
- To know whether market follow normal distribution.

On the basis of the objectives the following hypothesis are framed and tested

- Past Stock prices can be taken basis for predicting the future behaviour for BSE SENSEX and KSE.
- Stock prices are normally distributed for BSE SENSEX and KSE.
- Stock prices are moving in a random manner for BSE SENSEX and KSE.

Limitations of the study

- The study is confined to the behaviour of Indian stock market and Pakistan stock market.
- The study is purely based on secondary data.
- For the purpose of analysis BSESENSEX based companies and 30 shares on the bases of market capitalization is drawn from Karachi stock market.
- Conclusion based on Indian stock market and Pakistan stock market cannot be applied to the stock markets.
- The period of study is 17th September 2012 to 5th March 2014 covering a period of 365 days.

Research methodology

For the purpose of analysis following statistics tools are applied:

- Runtest.
- Kolmogorov Smirnovtest.
- KPSStest.

Results and Discussions

RUNTEST: Run test is conducted by Fama to ascertain whether the price changes are followed by further price changes of the same sign. We ignore the absolute value of numbers in the series and observe only the sign. As per Random Walk theory prices of the security is the result of free flow of information which the market observes quickly and efficiently. In the random theory we will compare total number of run in the data and the expected number of run under Random Walk Hypotheses. We are not considering amount of changes from the mean. Positive Z indicates that there are too many run in the sample and negative value of Z indicates that there less run than that one would expect .The changes are random. In order to compare the observe number of runs with expected number of run. To test the hypothesis that share price movement, takes place in a random manner or not. It is proper to apply Z test and P test. The following formula is used:

$$Z = R\text{-}X/\sigma \quad (1)$$

$$X = 2n1n2+1/(n1+n2) \quad (2)$$

$$\sigma 2 = \sqrt{2n1n2(2n1n2\text{-}n1\text{-}n2)/(((n1+n2)2(n1+n2\text{-}1))} \quad (3)$$

where: Ris the real number of runs; n1 + n2 = number of observationsin each category; σ = standard deviation; R = number of runs; Z = Standard normal distribution; Var(R) = Variance of the R.

Table 1 – Runs are Calculated for BSE Sensex Shares

S. NO	Company	Total no. of Runs	Total no. of Positive Observation	Total no. of Negative Observation
1	Axis BankLtd	16	180	185
2	BajajAutoLtd	26	170	195
3	Bharat Heavy Electricals Ltd	20	177	188
4	Bharti Airtel Ltd	33	204	161
5	Cipla Ltd	3	204	161
6	Coal India Ltd	16	156	209
7	Dr. Reddy's Laboratories Ltd	8	178	187
8	GAIL (India)Ltd	31	189	176
9	HDFC BankLtd	32	195	170
10	Hero MotoCorp Ltd	32	195	170
11	Hindalco Industries Ltd	16	205	160
12	Hindustan Unilever Ltd	11	211	154
13	Housing Development Finance Corporation Ltd	11	211	154

S. NO	Company	Total no. of Runs	Total no. of Positive Observation	Total no. of Negative Observation
14	ICICI Bank Ltd	39	193	172
15	Infosys Ltd	39	193	172
16	ITC Ltd	20	198	167
17	Larsen & Toubro Ltd	2	203	162
18	Mahindraand Mahindra Ltd	30	177	179
19	Maruti Suzuki India Ltd	12	172	184
20	NTPC Ltd	24	186	170
21	Oiland Natural Gas Corporation Ltd	20	156	209
22	Reliance Industries Ltd	4	212	153
23	Sesa Goa Ltd	4	192	173
24	State Bank of India	4	192	173
25	Sun Pharmaceutical Industries Ltd	5	140	225
26	Tata Consultancy Services Ltd	2	156	209
27	Tata Motors Ltd	8	139	229
28	Tata Power Company Ltd	12	180	185
29	Tata Steel Ltd	11	197	168
30	Wipro Ltd	10	168	197

Source: Secondary data

Table 2 – Comparison of Runs with Z Value and P Value

S. NO	Company	Z-value	P-value	Result
1	Axis BankLtd	-17.559	5.12E-69	REJECTED
2	Bajaj Auto Ltd	-16.498	3.77E-61	REJECTED
3	Bharat Heavy Electricals Ltd	-17.138	3.88E-66	REJECTED
4	Bharti Airtel Ltd	22.746	2	REJECTED
5	Cipla Ltd	-14.105	1.954499736	REJECTED
6	CoalIndia Ltd	9.338	-3.239498848	REJECTED
7	Dr.Reddy's Laboratories Ltd	-18.397	1.39E-75	REJECTED
8	GAIL (India) Ltd	-15.982	3.39E-57	REJECTED

S. NO	Company	Z-value	P-value	Result
9	HDFC Bank Ltd	1.617	1.08165E-56	NOT REJECTED
10	Hero Moto Corp Ltd	-15.866	5.41E-57	REJECTED
11	Hindalco Industries Ltd	-17.535	3.85E-69	REJECTED
12	Hindustan Unilever Ltd	-18.058	6.82E-73	REJECTED
13	Housing Development Finance Corporation Ltd	-18.058	3.41E-73	REJECTED
14	ICICI Bank Ltd	-10.975	5.0358E-28	REJECTED
15	Infosys Ltd	-15.135	9.56425E-52	REJECTED
16	ITC Ltd	-17.125	9.59593E-66	REJECTED
17	Larsen & Toubro Ltd	0.996	1.680667	NOT REJECTED
18	Mahindra and Mahindra Ltd	-15.816	2.41E-56	REJECTED
19	Maruti Suzuki India Ltd	-17.920	4.09E-72	REJECTED
20	NTPC Ltd	-16.594	3.85E-62	REJECTED
21	OilandNaturalGas Corporation Ltd	-17.098	7.73E-66	REJECTED
22	Reliance Industries Ltd	-18.810	6.28494E-79	REJECTED
23	Sesa Goa Ltd	-0.982	0.326016709	NOT REJECTED
24	State Bank of India	-18.816	5.58E-79	REJECTED
25	Sun Pharmaceutical Industries Ltd	-18.691	5.88E-78	REJECTED
26	Tata Consultancy Services Ltd	-19.025	1.05E-80	REJECTED
27	Tata Motors Ltd	-18.140	1.55E-73	REJECTED
28	Tata Power Company Ltd	-17.978	2.90E-72	REJECTED
29	Tata SteelLtd	-18.077	4.87E-73	REJECTED
30	WiproLtd	-18.182	7.15E-74	REJECTED

Source: Secondary data

Out of 30 SENSEX companies 7 companies lies between ± 1.96 so it can be stated that there are satisfying the hypothesis the share prices are moving in a random manner. In case of remaining 23 companies P value is higher than alpha but it does not fall between -1.96 to +1.96. It shows that market does not follow randomness. Since 2/3 SENSEX companies' prices does not follow the randomness, we reject the hypothesis and accept the alternative hypothesis. It's how clearly that present Indian market condition past price can be taken as basis for predicting the future behaviour. To just if your conclusion based on run test we applied Kolmogorov Smirnov test and KPSS test.

KolmogorovSmirnovtest(one-sample test)

A test for goodness off it usually involves examining a random sample from some unknown distribution in order to test the null hypothesis that the unknown distribution function is in fact a known, specified function. For random walk model to be true distribution of returns are supposed to be homogenous. Otherwise we can say that distribution is not homogenous.

Table 3 – One Sample KS Test

S. NO	Company	Skewness	Kurtosis	Significance value	Result
1	Axis BankLtd	-0.236	-0.138	0.2	NORMALLY DISTRIBUTED
2	Bajaj Auto Ltd	0.332	-0.703	0	NOT NORMALLY DISTRIBUTED
3	Bharat Heavy Electricals Ltd	0.178	-0.976	0	NOT NORMALLY DISTRIBUTED
4	Bharti Airtel Ltd	-0.257	-0.583	0.002	NOT NORMALLY DISTRIBUTED
5	Cipla Ltd	-0.257	-0.583	0.002	NOT NORMALLY DISTRIBUTED
6	Coal India Ltd	0.174	-1.11	0	NOT NORMALLY DISTRIBUTED
7	Dr. Reddy's Laboratories Ltd	0.236	-1.151	0	NOT NORMALLY DISTRIBUTED
8	GAIL (India) Ltd	-0.015	-0.207	-0.039	NOT NORMALLY DISTRIBUTED
9	HDFC Bank Ltd	-0.404	0.331	0.026	NOT NORMALLY DISTRIBUTED
10	Hero Moto Corp Ltd	-0.404	0.331	0.026	NOT NORMALLY DISTRIBUTED
11	Hindalco Industries Ltd	-0.131	-0.557	0.001	NOT NORMALLY DISTRIBUTED
12	Hindustan Unilever Ltd	-0.243	-0.21	0	NOT NORMALLY DISTRIBUTED
13	Housing Development Finance Corporation Ltd	-0.243	-0.21	0	NOT NORMALLY DISTRIBUTED
14	ICICI Bank Ltd	-0.674	0.472	0	NOT NORMALLY DISTRIBUTED
15	Infosys Ltd	-0.674	0.472	0	NOT NORMALLY DISTRIBUTED
16	ITC Ltd	-0.012	-0.373	0.046	NOT NORMALLY DISTRIBUTED
17	Larsen & ToubroLtd	-0.24	-1.499	0	NOT NORMALLY DISTRIBUTED

S. NO	Company	Skewness	Kurtosis	Significance value	Result
18	Mahindra and Mahindra Ltd	-0.37	-0.237	0.001	NOT NORMALLY DISTRIBUTED
19	Maruti Suzuki India Ltd	0.185	0.255	0.021	NOT NORMALLY DISTRIBUTED
20	NTPC Ltd	-0.177	-0.147	0.2	NORMALLY DISTRIBUTED
21	Oil and Natural Gas Corporation Ltd	0.255	-0.949	0	NOT NORMALLY DISTRIBUTED
22	Reliance Industries Ltd	-0.144	-1.451	0	NOT NORMALLY DISTRIBUTED
23	Sesa Goa Ltd	-0.002	-1.325	0	NOT NORMALLY DISTRIBUTED
24	State Bank of India	-0.002	-1.325	0	NOT NORMALLY DISTRIBUTED
25	Sun Pharmaceutical Industries Ltd	0.777	-0.451	0	NOT NORMALLY DISTRIBUTED
26	Tata Consultancy Services Ltd	0.354	-1.415	0	NOT NORMALLY DISTRIBUTED
27	Tata Motors Ltd	0.587	-1.012	0	NOT NORMALLY DISTRIBUTED
28	Tata Power Company Ltd	0.112	-1.242	0	NOT NORMALLY DISTRIBUTED
29	Tata Steel Ltd	-0.42	-0.828	0	NOT NORMALLY DISTRIBUTED
30	Wipro Ltd	-0.524	-0.829	0	NOT NORMALLY DISTRIBUTED

Source: Secondary Data

From the above table it is very clear thatout of 30 companies only two companies (Axis Bank Ltd and NTPC Ltd) are normally distributed others are not distributed. Hencewe conclude thatarandomwalkmodelisnotapplicableforthestudy period. That means past prices can be taken as base for predicting the future price.

KPSS TEST

The alternative unit root test introduced by Kwiatkowski–Phillips–Schmit– Shin(KPSS) in the year 1992 and called KPSS test, has the null hypothesis stationary of a series around either mean or a linear trend. The KPSS test is the sum of three components i.e. deterministic trend, a random walk and a stationary error term.

The model takes the following form;

$$y_t = \xi t + r_t + \varepsilon_t$$

$$r_t = r_{t-1} + \mu_t \qquad (4)$$

where: yt, t=1,2,…;T denotes series of observation of interest, t – deterministic trend, r-random walk process, μt- error term of the first equation, by assumption is stationary, μt denotes an error term of second equation ,the assumption of the series is identically distributed random variables of expected value equal to zero and constant.

Table 4 - KPSS Test is calculated for BSE Sensex Shares

S. NO	Company	Ttest	Critical Value	RESULT
1	Axis Bank Ltd	0.067	0.463	NOT REJECT
2	Bajaj Auto Ltd	0.565	0.463	REJECT
3	Bharat Heavy Electricals Ltd	0.203	0.463	NOT REJECT
4	Bharti Airtel Ltd	0.048	0.463	NOT REJECT
5	Cipla Ltd	0.348	0.463	NOT REJECT
6	CoalIndia Ltd	0.212	0.463	NOT REJECT
7	Dr.Reddy's Laboratories Ltd	0.231	0.463	NOT REJECT
8	GAIL (India) Ltd	0.459	0.463	NOT REJECT
9	HDFC Bank Ltd	0.086	0.463	NOT REJECT
10	Hero Moto Corp Ltd	0.086	0.463	NOT REJECT
11	Hindalco Industries Ltd	0.622	0.463	REJECT
12	Hindustan Unilever Ltd	0.394	0.463	NOT REJECT
13	Housing Development Finance Corporation Ltd	0.449	0.463	NOT REJECT
14	ICICI Bank Ltd	0.458	0.463	NOT REJECT
15	Infosys Ltd	0.458	0.463	NOT REJECT
16	ITC Ltd	0.139	0.463	NOT REJECT
17	Larsen & Toubro Ltd	0.183	0.463	NOT REJECT
18	Mahindraand Mahindra Ltd	0.1	0.463	NOT REJECT
19	Maruti Suzuki India Ltd	0.362	0.463	NOTREJECT
20	NTPC Ltd	0.143	0.463	NOTREJECT
21	Oil and Natural Gas Corporation Ltd	1.907	0.463	REJECT
22	Reliance Industries Ltd	0.366	0.463	NOT REJECT
23	Sesa Goa Ltd	0.193	0.463	NOT REJECT
24	State Bank of India	0.193	0.463	NOT REJECT
25	Sun Pharmaceutical Industries Ltd	0.365	0.463	NOT REJECT

S. NO	Company	Ttest	Critical Value	RESULT
26	Tata Consultancy Services Ltd	0.217	0.463	NOT REJECT
27	Tata Motors Ltd	0.186	0.463	NOT REJECT
28	Tata Power Company Ltd	0.202	0.463	NOT REJECT
29	Tata Steel Ltd	0.406	0.463	NOT REJECT
30	Wipro Ltd	0.165	0.463	NOT REJECT

Source: Secondary data

The result clearly shows that out of 30 companies 27 companies critical value is less than the test value. Hence we cannot reject the hypothesis. That means share prices are not moving in a random manner.

With the help of run test, KS test and KPSS test we are able to conclude that the behaviour of Indian Stock is quite different and share prices are not moving in a random manner and past prices can be taken as basis for predicting the future behaviour. Analysis & Interpretation for KSE

Table 5 – Runs are calculated for KSE Shares

S. NO	Company	Total no. of Runs	Total no. of Positive observation	Total no. of Negative observation
1	Askari Bank	19	182	183
2	Adamjee Insurance	27	156	209
3	Allied Bank Limited	12	200	165
4	Arif Habib Securities	16	186	179
5	Bank Alfalah	4	208	157
6	Bank of Punjab	15	196	169
7	Dawood Hercules Chemicals	20	146	219
8	EFU General Insurance	31	147	218
9	EFU Life Assurance	42	212	153
10	Engro Chemical	18	178	187
11	Fauji Fertilizer Bin Qasim	22	229	136
12	Fauji Fertilizer Company	18	156	209
13	Habib Metropolitan Bank	4	244	121
14	Hub Power Company	3	177	188

S. NO	Company	Total no. of Runs	Total no. of Positive observation	Total no. of Negative observation
15	Jahangir Siddiqui & Company	16	191	174
16	Kot Addu Power Company	13	122	243
17	Lucky Cement	2	198	167
18	Muslim Commercial Bank	4	168	197
19	National Bankof Pakistan	28	183	182
20	Nestlé Pakistan	16	181	184
21	NIB Bank	45	207	158
22	Oil and Gas Development Company Limited	2	173	192
23	Pakistan Oil fields	20	177	188
24	Pakistan Petroleum	10	203	162
25	Pakistan State Oil	12	189	176
26	Pakistan Telecommunication Company Ltd	2	194	171
27	Pakistan Tobacco Company	2	220	145
28	Standard Chartered Bank (Pakistan)	8	173	192
29	Sui Northern Gas Pipelines	29	160	205
30	United Bank Limited	38	211	154

Source: Secondary Data

Table 6 - Comparisons of Runs with Z Value and P Value of KSE

S. NO	Company	Z-value	P-value	Result
1	Askari Bank	-17.244	15.668	NOT REJECTED
2	Adamjee Insurance	-16.348	70.677	NOT REJECTED
3	Allied Bank Limited	-17.968	74.840	NOT REJECTED
4	Arif Habib Securities	-17.558	33.817	NOT REJECTED
5	Bank Alfalah	-18.812	19.981	NOT REJECTED

S. NO	Company	Z-value	P-value	Result
6	Bankof Punjab	-17.656	10.438	NOT REJECTED
7	Dawood Hercules Chemicals	-17.058	50.217	NOT REJECTED
8	EFU General Insurance	-15.864	84.055	NOT REJECTED
9	EFU Life Assurance	-14.719	3.741	NOT REJECTED
10	Engro Chemical	-17.348	139.671	NOT REJECTED
11	Fauji Fertilizer Bin Qasim	-16.780	39.650	NOT REJECTED
12	Fauji Fertilizer Company	-17.312	112.327	NOT REJECTED
13	Habib Metropolitan Bank	-18.783	19.746	NOT REJECTED
14	Hub Power Company	-18.921	56.628	NOT REJECTED
15	Jahangir Siddiqui & Company	-17.556	12.741	NOT REJECTED
16	Kot Addu Power Company	-17.724	58.828	NOT REJECTED
17	Lucky Cement	-19.026	206.886	NOT REJECTED
18	Muslim Commercial Bank	-18.815	238.048	NOT REJECTED
19	National Bankof Pakistan	-16.301	49.718	NOT REJECTED
20	Nestlé Pakistan	-17.559	5.718	NOT REJECTED
21	NIB Bank	-14.435	2.389	NOT REJECTED
22	Oiland Gas Development Company Limited	-19.026	226.633	NOT REJECTED
23	Pakistan Oil fields	-17.138	472.810	NOT REJECTED
24	Pakistan Petroleum	-18.176	198.160	NOT REJECTED
25	Pakistan State Oil	-17.977	272.288	NOT REJECTED
26	Pakistan Telecommunication Company Ltd	-19.026	22.958	NOT REJECTED
27	Pakistan Tobacco Company	-19.024	232.500	NOT REJECTED
28	Standard Chartered Bank (Pakistan)	-18.396	16.512	NOT REJECTED
29	Sui Northern Gas Pipelines	-16.151	21.475	NOT REJECTED
30	United Bank Limited	-15.157	147.069	NOT REJECTED

Source: Secondary Data

If Z-value is more than -1.96 and less than +1.96 then value will be known as significant which means that prices of the security appears in random fashion and if Z-value is less than -1.96 and more than +1.96 then value will be known as in significant which means that prices of the security are not appearing in random fashion.

Here the P-value which is greater than alpha (i-e.0.05).If P-value is greater than alpha it means that value of z-statistic do fall between ±1.96 hence we accept the null hypothesis that means past share prices cannot be taken as base for predicting the future price. It is holds good for entire 30 companies mentioned above.

Table 7 –One Sample Ks Test for KSE

S. NO	Company	Skewness	Kurtosis	Significant	Result
1	Askari Bank	-0.128	-0.664	0.973	NORMALLY DISTRIBUTED
2	Adamjee Insurance	-0.549	-0.028	0.923	NORMALLY DISTRIBUTED
3	Allied Bank Limited	0.115	-0.742	0.963	NORMALLY DISTRIBUTED
4	Arif Habib Securities	0.344	-0.913	0.955	NORMALLY DISTRIBUTED
5	Bank Alfalah	0.662	-0.889	0.886	NORMALLY DISTRIBUTED
6	Bank of Punjab	0.578	-0.764	0.915	NORMALLY DISTRIBUTED
7	Dawood Hercules Chemicals	0.41	0.092	0.925	NORMALLY DISTRIBUTED
8	EFU General Insurance	-0.043	1.36	0.848	NORMALLY DISTRIBUTED
9	EFU Life Assurance	1.484	2.052	0.846	NORMALLY DISTRIBUTED
10	Engro Chemical	0.236	-0.429	0.969	NORMALLY DISTRIBUTED
11	Fauji Fertilizer Bin Qasim	0.817	-0.207	0.919	NORMALLY DISTRIBUTED
12	Fauji Fertilizer Company	-0.383	-0.448	0.978	NORMALLY DISTRIBUTED
13	Habib Metropolitan Bank	0.604	-0.877	0.879	NORMALLY DISTRIBUTED
14	Hub Power Company	-0.079	-1.338	0.923	NORMALLY DISTRIBUTED
15	Jahangir Siddiqui & Company	0.09	-0.834	0.973	NORMALLY DISTRIBUTED
16	Kot Addu Power Company	-0.991	-0.14	0.873	NORMALLY DISTRIBUTED
17	Lucky Cement	0.459	-1.113	0.907	NORMALLY DISTRIBUTED

S. NO	Company	Skewness	Kurtosis	Significant	Result
18	MuslimCommercial Bank	-0.371	-1.215	0.893	NORMALLY DISTRIBUTED
19	National Bank of Pakistan	-0.172	-0.994	0.961	NORMALLY DISTRIBUTED
20	Nestlé Pakistan	1.103	1.053	0.879	NORMALLY DISTRIBUTED
21	NIB Bank	0.845	0.591	0.95	NORMALLY DISTRIBUTED
22	Oiland Gas Development Company Limited	0.113	-1.409	0.92	NORMALLY DISTRIBUTED
23	Pakistan Oil fields	-0.111	-1.129	0.959	NORMALLY DISTRIBUTED
24	Pakistan Petroleum	0.681	-0.81	0.862	NORMALLY DISTRIBUTED
25	Pakistan State Oil	0.165	-1.49	0.907	NORMALLY DISTRIBUTED
26	Pakistan Telecommunication Company Ltd	0.106	-1.351	0.937	NORMALLY DISTRIBUTED
27	Pakistan Tobacco Company	1.209	0.297	0.792	NORMALLY DISTRIBUTED
28	Standard Chartered Bank (Pakistan)	0.494	-0.821	0.921	NORMALLY DISTRIBUTED
29	Sui Northern Gas Pipelines	-0.408	0.14	0.959	NORMALLY DISTRIBUTED
30	United Bank Limited	0.102	-0.334	0.979	NORMALLY DISTRIBUTED

Source: Secondary Data.

Here all values are normally distributed. Hence we conclude a random walk model is applicable for the study period. That means past prices cannot be taken as base for predicting the future price.

Table 8 – KPSS test is calculated for KSE Shares

S. NO	COMPANY	Test Statistics	Critical Value	Results
1	Askari Bank	1.433	0.463	REJECTED
2	Adamjee Insurance	0.401	0.463	NOT REJECTED
3	Allied Bank	1.584	0.463	REJECTED
4	ARIFHABIB SECURITIES	0.452	0.463	NOT REJECTED
5	BANKALFALAH	2.019	0.463	REJECTED
6	Bank of Punjab	1.153	0.463	REJECTED
7	Dawood Hercules Chemicals	1.775	0.463	REJECTED

S. NO	COMPANY	Test Statistics	Critical Value	Results
8	EFU General Insurance	0.109	0.463	NOT REJECTED
9	EFU Life Assurance	0.479	0.463	REJECTED
10	Engro Chemical	1.243	0.463	REJECTED
11	Fauji Fertilizer Bin Qasim	1.465	0.463	REJECTED
12	Fauji Fertilizer Company	0.651	0.463	NOT REJECTED
13	Habib Metropolitan Bank	1.651	0.463	REJECTED
14	Hub Power Company	1.820	0.463	REJECTED
15	Jahangir Siddiqui & Company	1.680	0.463	REJECTED
16	Kot Addu Power Company	0.699	0.463	REJECTED
17	Lucky Cement	2.289	0.463	REJECTED
18	Muslim Commercial Bank	1.193	0.463	REJECTED
19	National BankofPakistan	0.972	0.463	REJECTED
20	Nestlé Pakistan	1.631	0.463	REJECTED
21	NIB Bank	0.146	0.463	NOT REJECTED
22	Oil and Gas Development Company Limited	2.373	0.463	REJECTED
23	Pakistan Oil fields	1.392	0.463	REJECTED
24	Pakistan Petroleum	1.603	0.463	REJECTED
25	Pakistan State Oil	1.695	0.463	REJECTED
26	Pakistan Telecommunication Company Ltd	2.394	0.463	REJECTED
27	PakistanTobaccoCompany	1.990	0.463	REJECTED
28	Standard Chartered Bank (Pakistan)	2.190	0.463	REJECTED
29	Sui Northern Gas Pipelines	0.146	0.463	NOT REJECTED
30	United Bank Limited	1.165	0.463	REJECTED

Source: Secondary Data

If test statistics is higher than the critical value should reject the hypothesis that means there is no stationary. If test statistics is lower than the critical value we cannot reject the hypothesis. Analysis

clearly shows out of 30 companies 26 companies critical value is less than the test value, so there is a not stationary.

Findings

- On the basis of the analysis made above, the following findings are made;
- In the run test calculated for BSE SENSEX shares it is oBSErved that Reliance industries is having 212 of positive run and in case of negative runs Tata Motors Ltd is having 225 runs followed by Sun Pharmaceutical Industries Ltd(220) runs;
- In case of KSE Habib Metropolitan Bank is having 212 of positive run and in case of negative runs Kot Addu Power Company 243 runs followed by Dawood Hercules Chemicals 219 runs.
- On the bases of Z values and P values, it is concluded that past price can be taken as base for predicting the future behaviour as far as Indian stock market is concern.
- As regards as Karachi stock exchange for the same period conclusion is different past price cannot be taken as for predicting the future share price movement.
- One sample Kolmogorov Smirnov test for BSE SENSEX shares reveals that the fact share prices are not normally distributed.
- One sample Kolmogorov Smirnovtest for KSE shares reveals the fact share prices are normally distributed.
- KPSS test for BSE SENSEX brings out the fact that out of 30 companies 27 companies critical value is less than the test value. It means that share prices are not moving in a random manner.
- As regards as KPSS test for Karachi stock exchange out of 30 companies 26 companies critical value is less than the test value. It means that share prices are moving in a random manner.
- The result clearly reveals that past price movement cannot be taken as a base for predicting the future price as for as Karachi stock exchange is concerned were as it can be taken as a bases for predicting the future price movement for BSE.

Conclusion

The researcher made an attempt to find out to what extent Indian stock market as well as Pakistani stock market is able to fit into that concept of efficient market hypothesis. The findings really show that stock prices are not moving in a random manner in India whereas it moves in a random manner in Pakistan. As a result investors can make abnormal profit in India by entering into the stock market in the appropriate time whereas it may not be possible for Pakistani investors.

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PRACTICAL APPLICATION OF THE ANALYTIC HIERARCHY PROCESS ON SUPPLIER SELECTION PROBLEM

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Abstract:
This article deals with multi-criteria decision making. The first part of the article consists of the theoretical familiarization with the decision of supplier selection. Following this is a description of the mathematical definition of the Analytic Hierarchy Process (AHP) method. The article focuses on supplier selection based on assessment criteria using the AHP method. The AHP has been applied to the problem of selecting a particular supplier for a windows glazing company. Criteria have been determined and match paired by using Saaty's scoring scale. The values determined for pairwise comparisons have subsequently been imported into a software tool for the multi-criteria decision making method AHP - Make It Rational. The weights of individual criteria have been detected by this software tool. The actual values of each criterion have been normalized using the Euclidean metric. The output is the final selection of the optimal supplier according to specified criteria.

Key words: Analytic hierarchy process, supplier selection, multi-criteria decision making problem, criterion.

JEL Classification: C440, M110

1. Introduction and objective of the article

This article focuses on supplier selection based on requirements, which is a typical multi-criteria decision-making problem. This topic is still highly relevant. Entrepreneurial subjects, especially small and medium-sized companies, often do not use any specific methods of multi-criteria decision making in the selection and evaluation of suppliers. Supplier selection is subjective, based on previous experience or long-term relationships or the entrepreneur bases his decision on only a single criterion, which is usually the price. Entrepreneurial subjects should be familiarized with relatively simple and software-supported decision-making methods that can be used for supplier selection and evaluation.

There are various appropriate methods for their solution to different decision problems. Therefore, the correct formulation of a problem is absolutely necessary. Simply said, the decision on the supplier or suppliers of the organization develops at two stages – two decision making problems. The first stage is deciding on the number of suppliers of the materials, products, etc. The company determines whether to use only one, two or more suppliers for the necessary components. In certain cases it may consider other options, such as insourcing, etc. The second stage, which will be the content of this article, consists of deciding on the actual supplier or group of suppliers, on the basis of predetermined criteria.

This article focuses on supplier selection based on assessment criteria according to the AHP method. The definition of the issue of supplier choice and mathematical principles of the Analytic Hierarchy Process (AHP) will be determined in the first part of this article. In the following part the specific decision making problem, criteria selection and subsequently its solution will be described.

2. Theoretical bases of the supplier selection

When selecting a supplier (or group of suppliers), the first step is the selection of possible alternatives - i.e. finding potential suppliers and exclude those who, for some reason, do not come into consideration. The following is the establishment of criteria by which it will be decided. These criteria differ depending on the type of organization, its size, its position in the logistics chain, business field and of course on preferences. An effective vendor selection process requires the consideration of many quantitative as well as qualitative factors (Gadakh, 2013). Generally, these criteria can be divided into several areas: pricing and payment terms, delivery terms and conditions, requirements on technical parameters, material composition and design, requirements for product quality, distance suppliers, transportation options and packaging requirements, limitations associated with suppliers abroad (cultural, legal, etc.).

Other options may include requirements on flexibility, innovation, taking into account possible organizational strategic issues - financial situation, reputation, available workforce, etc. (Chan, Chan, 2010).

It is also possible to use the reverse process, first to select criteria and then, according to these criteria, to create or search out suitable alternatives - suppliers (Ramík, Perzina, 2008).

After selecting alternatives and criteria it is necessary to choose the appropriate method of multi-criteria decision making. In this article, the AHP method is used.

3. Theoretical bases of the analytic hierarchy process

The Analytic Hierarchy Process is a decomposition method that falls among methods based on pairwise comparison of alternatives based on the rated criteria. This group of methods includes Saaty's method of pairwise comparisons. It is through the development of this method that the Analytic Hierarchy Process was created. The AHP method is based on maximizing the utility function.

The author of the AHP is Thomas L. Saaty. It was designed as a decision aid to solve problems in economics, socio-economics and management (Saaty, 1980). In 2001, Saaty further specified the seven pillars of the Analytic Hierarchy Process (Saaty, 2001). Since then, the AHP method has been developed, supplemented by other methods and often used as an appropriate tool to deal with multi-criteria decision making problems, including decisions on supplier selection.

Among the strictly necessary considerations for understanding the method of the AHP are the concepts of hierarchy and priority. The hierarchy - hierarchical structure - is a particular type of system that is based on the assumption that the identified elements of the system can be grouped into disjoint sets, where the elements of one group have an impact on the elements of another group, while they themselves are affected by elements yet another single group. Elements in a group - in one level - are mutually independent (Ramík, Perzina, 2008). Priority is the subjective preference of one element relative to one or more other elements.

3.1. Definition of mathematical principles of the Analytic Hierarchy Process

The AHP allows structuring a complicated problem into a hierarchical form (Chan, Chan, 2010) - thus decomposing it into parts and putting these into a hierarchical structure. An example of a simplified hierarchical structure is shown in Figure 1.

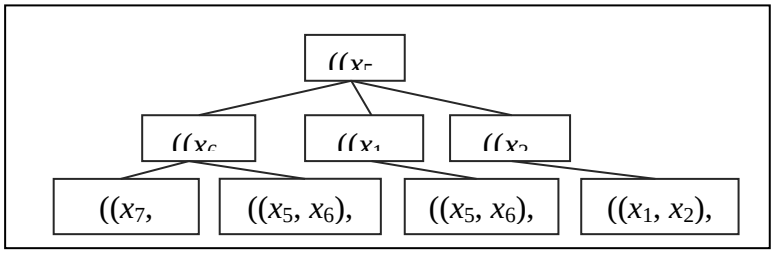

Figure 1 *- Example of a hierarchical structure*

It is followed by the pairwise comparison of each component on the hierarchical level with each other, and always with respect to the element, which precedes them in the superior hierarchical level. The result of these subjective cardinal pairwise comparisons is the ratios of w_{ki} / w_{kj}, namely by using the basic scale - in this case, the Saaty's scoring scale will be mentioned. In this way, we get an actual square matrix, S_f of m x m pairwise comparisons, whose elements s_{ij} represent estimates of the proportion weights of the criteria, thus s_{ij} represents the ratio between the significance of x_i to the significance of x_y, due to the relevant hierarchical superior element (criteria) $f \in L_{k-1}$, thus the ratio of weights v_i and v_j.

$$s_{ij} \approx \frac{v_i}{v_j}, \qquad i, j = 1, 2, \ldots m. \tag{1}$$

If the i criterion is more significant than the j criterion, or their significance is the same, then it applies that $s_{ij} \geq 1$. If it is the opposite, the relation is

$$s_{ij} = \frac{1}{s_{ji}} \tag{2}$$

So first the pairs of criteria from a given hierarchical level will be organized into a table, where these criteria are recorded in rows and columns. The following is a comparison between them according to the hierarchically superior criterion by determining the direction of preference and the weight of this preference. The weight of preference can be expressed using Saaty's recommended nine-point scale with descriptors - see Table 1. Values 2, 4, 6 and 8 can be used to refine the weight of the criteria.

Table 1- *Point scale with descriptors recommended by Saaty*

Number of points	Descriptor
1	The criteria are equally important
3	The first criterion is slightly more significant than the second
5	The first criterion is quite more significant than the second
7	The first criterion is clearly more significant than the second
9	The first criterion is absolutely more significant than the second

Source: Fotr, Dědina and Hrůzová (2003)

But the values of weights of criteria v_i and v_j are not known and it is necessary to determine them. One of the methods used is Saaty's method of the right eigen vector w. From the matrix obtained from the pairwise comparisons, the eigenvector corresponding to the maximum eigenvalue $(\lambda_{\max})$ of matrix S_f, by solving a system of m equations of m unknowns $w = (w_1, w_2, ...w_m)$ will be calculated, which is expressed in vector form as

$$(S_f - \lambda_{\max} \mathrm{I}) w = 0, \tag{3}$$

or equivalently also:

$$S_f = \lambda_{\max} w \mathrm{I}\ , \tag{4}$$

where: $\lambda_{\max}$ is the maximum eigenvalue of matrix S_f, I is the identity matrix, w is the eigenvector of the matrix.

From the eigenvector w the searched weights can be determined as follows

$$v_i = w_i / \|w\| \qquad i = 1, 2, ...m, \tag{5}$$

Where $\|w\|$ indicates the weight of eigen vector w.

The calculation procedure and characterization of the AHP by using the correct eigenvector method was taken from Ramík and Perzina (2008).

Among other methods for estimating weights of criteria we can include, for instance, the logarithmic least squares method, it is sometimes also referred to as the geometric mean method, see for example, Hančlová *et al.* (2010), Fiala, Jablonský and Maňas (1994) or Dijkstra (2013), which determines estimates of weights as normalized geometric means of rows of matrix S_f, in this case, marking matrix S may be used.

$$v_i = \frac{R_i}{\sum_{i=1}^{m} R_i} = \frac{\left[\prod_{j=1}^{m} s_{ij}\right]^{1/m}}{\left[\sum_{i=1}^{m}\prod_{j=1}^{m} s_{ij}\right]^{1/m}}, i = 1,2,...,m, \quad (6)$$

where R_i is the i-th row of the matrix S.

The revised estimations and improvement of their consistency can be achieved through an iterative process. In this process, elements of matrix s_{ij} and the calculated proportions v_i / v_j are presented to the decision-maker together for comparison and modify elements s_{ij}, on which new estimates of weights can be calculated.

It has been said that these methods are mathematically demanding. For this reason, organizations may wish to use software designed to calculate the weights of the criteria in the Analytic Hierarchy Process. The most popular of these is Expert Choice, and then we can name Right Choice, Make It Rational and more.

Within the AHP, it is necessary to also take into account the individual variants. In this case, weights of considered variants can be determined, for example by Saaty's method using pairwise comparison, where $v = (v_1, v_2, ..., v_k)$ means the weights of criteria which reflect their relative importance to the decision maker. The matrix of weights of evaluating variants according to individual criteria is denoted $W = \left(w_{ij}\right)$, where w_{ij} represents the weight of variant a_i which is evaluated according to criteria f_j. The aggregated weight of variant a_i in terms of all the criteria can be calculated as:

$$w_i = \sum_{j=1}^{n} v_j w_{ij}, i = 1,2,..., p. \quad (7)$$

The aggregated weights then represent a certain utility. As the best variant is then considered the one with the highest aggregated weight or variants can be arranged according to the decreasing values of aggregated weights.

Other options of how to work with the actual values of the criteria for each variant is normalization using some of standardization methods, so that all actual values of the criteria within the individual variants lie in the interval $\langle 0,1 \rangle$. The AHP in this case, is then completed by finding the criteria weights and then the selection of the optimal variant according to the relation (11).

3.2 Consistency index and consistency ratio

In order to use the above procedures, an adequate consistency of pairwise comparison matrix is required. Measurement of the consistency is based on the fact that the larger the "irregularities" in the assignment matrix of pairwise comparisons, the greater the difference $\lambda_{\max} - k$. This difference cannot be considered absolute, but only in relation to the order of the matrix. According to Saaty the consistency index is defined as

$$C.I. = (\lambda_{\max} - k)/(k-1), \quad (8)$$

where k is the number of criteria and $\lambda_{\max}$ is the largest eigenvalue of the matrix.

The largest eigenvalue of the matrix can be determined as

$$\lambda_{\max} = \frac{1}{N}\sum_{i}^{N} \left(S \cdot w\right)_i / w_i, \quad (9)$$

where w is the vector.

If the value of this index is $C.I. < 0,1$, the matrix of pairwise comparisons can be considered as sufficiently consistent.

Another way to verify the consistency of the matrix of pairwise comparisons is the consistency ratio.

$$C.R. = C.I. / R.I., \quad (10)$$

where $R.I.$ is the average consistency index for 500 randomly generated reciprocal matrices using Saaty's range of 1 to 9. For an overview of different values of the average index of $R.I.$ for different matrix orders, see Table 2. (Fiala, Jablonský and Maňas, 1994).

Table 2 - *Selected values of the index* $R.I.$

k	3	4	5	6	7	8	10	12	15
$R.I.$	0,58	0,90	1,12	1,24	1,32	1,41	1,49	1,53	1,59

Source: Fiala, Jablonský and Maňas (1994, pp. 92).

Note: The matrix is considered to be sufficiently consistent, if $C.R. < 0,1$.

3.3 Comprehensive criterion

The comprehensive criterion used by the AHP is a multi-criteria utility function (Fotr, Dědina and Hrůzová, 2003; Fiala, Jablonský and Maňas, 1994). This approach is based on a system of axioms that apply to the behaviour of the subject during the differentiation of preferences of an individual variant by decision making under certainty.

The utility function assigns each variant of decision making its utility, which is expressed by a real number. The higher its utility is, the more a given variant is preferred. In practice, the method of the weighted sum which is committing a certain simplification that requires only a linear function of utility is used.

$$U_i = \sum_j w_j \cdot x_{ij}, \quad (11)$$

where: U_i is the utility of the i-th variant, w_j is the weight of the j-th criterion, x_{ij} is the value of the j[th] criterion for the i[th] variant.

The variant, which reaches a maximum value of the utility, is considered the best. Alternatively, you can arrange variants according to the increasing values of the utility.

The partial utility function, $f\left(x_{ij}\right) = x_{ij}$, as well as individual variants, are typically standardized so that they acquire the values of the interval $\langle 0,1 \rangle$.

4. Application of the analytic hierarchy process in a supplier selection

In the following section the AHP is used on a particular case of business practice. The entrepreneur or potential suppliers are not named in the text, in accordance to their own wishes.

4.1. Information about the problem

A small glazier company uses the services of several suppliers of windows for detached houses within its activities. The company currently does not use any method of evaluating suppliers. A particular supplier selection is always based on a personal inspection service, references from clients and business conditions.

To classify the given decision problem, we can say that it is:

- deterministic model,
- multi-criteria decision-making problem,
- there is a single decision maker,
- looking for the optimal variant - optimal supplier,
- cardinal information about criteria and alternatives,
- finite number of variants - potential suppliers,

- criteria are quantitative and qualitative,
- decision making is conflict-free,
- decision making is static.

Using the AHP, the best supplier of windows from three examined companies - variants- (Supplier A, Supplier B, Supplier C) will be selected. As important groups of the criteria, which were based on consultations with the business owners and theoretical knowledge concerning the selection of the contractor, payment terms, quality and range of products have been selected. These criteria have been then further specified on the sub-criteria. For segmentation of the criteria into a structure, see Figure 2.

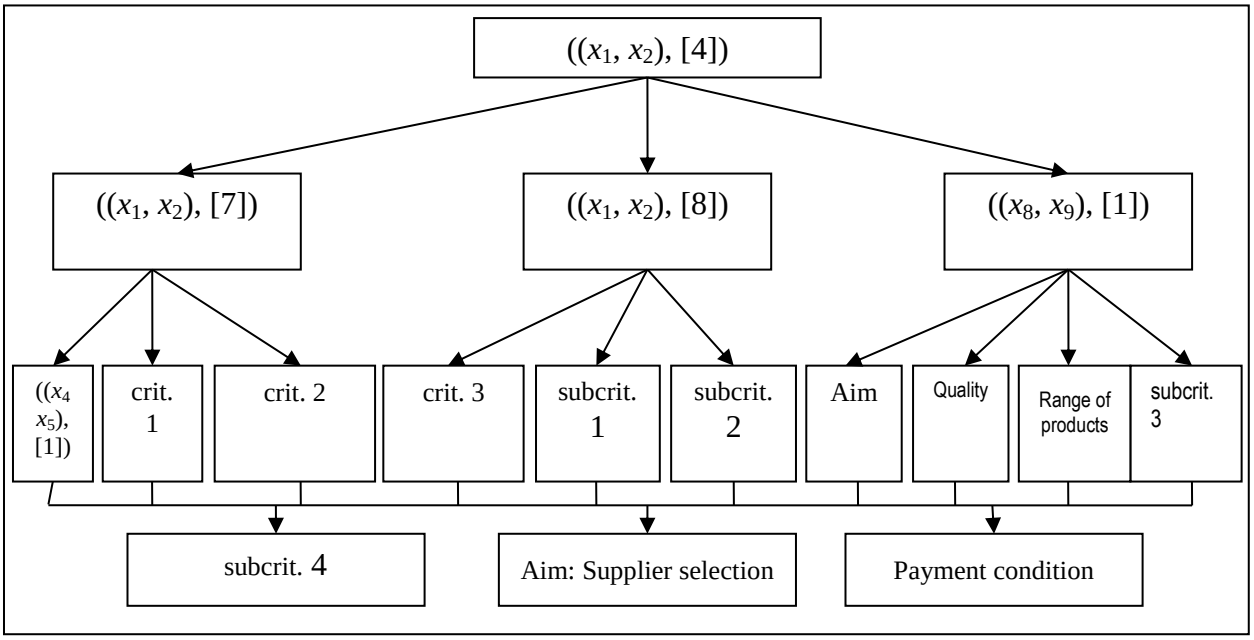

Figure 2 - The hierarchical system of criteria and sub-criteria

4.2. Contents of the selected sub-criteria

The values of the individual criteria have been collected from publicly available sources (websites of the companies and data of the Ministry of Environment) and data that companies sent in response to the online order of windows.

a) Sub-criterion: Price

Price is a typical quantitative criterion of cost type (lower values are preferred over higher). The demand for ten pieces of single-leaf turning and hinged plastic windows for a new building with the following parameters was sent to all three of the companies examined:

- width 1150 mm, height 1250 mm,
- interior window sills (150 mm) outer sills (90 mm),
- colour: wood decor from inside and outside,
- triple glazing, the requirement for installation and bricklaying.

The price was then taken from the received draft purchase contract.

b) Sub-criterion: Discounts

Again a quantitative criterion, but this time of yield type (higher values are preferred over lower). These are the quantity discounts that the company offered on the requested windows.

c) Sub-criterion: Mounting, transport, embedding

This is a quantitative criterion of cost type. Mounting, transport, embedding is usually free. Some companies, however, charge for certain activities, and that is why it is necessary to quantify the amount. It should be noted that it has been ascertained from the received draft purchase contract.

d) Sub-criterion: Certification and reference

Under this criterion, a company certified according to ISO 9001 and Czech brand and product certification of their product range and CE marking is included. This is a yield criterion with quantitative and qualitative characters therefore, it will be necessary to correctly calculate its value.

e) Sub-criterion: Warranty on windows

This is a quantitative criterion of yield type. The warranty period varies depending on the part of the window. The extended warranty is usually for PVC profiles, hinges, locks and other accessories. This criterion covers the warranty on the windows as a whole, according to the individual companies' guarantee.

f) Sub-criterion: Program „Zelená úsporám"

This includes information on whether the company is included in the program „Zelená úsporám" – The Green Savings programme - and is listed in the register of participants (List of Qualified Suppliers[6]). This is a qualitative criterion of yield type.

g) Sub-criterion: Frames

This is a qualitative criterion of yield type. The question is whether companies offer both plastic and wood and aluminium window frames.

Includes the number of profiles of suppliers of the companies examined, this means the range of their offer. This is a quantitative criterion of yield type.

h) Sub-criterion: Colours

This includes the number of possible colours. This is a quantitative criterion of yield type.

i) Sub-criterion: Hinges, knobs

An indication of the type of offered fitting for windows, and the preferred brand is the Austrian company MACO - this is a qualitative criterion of yield type.

4.3. Pairwise comparison of the criteria and sub-criteria under Saaty's method

Figure 2 shows that the criteria are presented in two levels. In the first level the payment conditions, quality and range of products will be benchmarked with regard to supplier selection. Saaty's recommended point scale with descriptors serve for pairwise comparisons, see Table 1. Paired comparisons of the first level are found in Table 3. Comparisons have been done in cooperation with the owner of a company who is familiar with the scoring scale and the principle of the Saaty's method.

Table 3 - Paired comparisons between the criteria of the first hierarchical level

	Supplier selection	**Payment conditions**	**Quality**	**Range of products**
	Payment conditions	1	1/6	1/5
	Quality	6	1	3
Price	Range of products	5	1/3	1

The second level consists of the three groups sub-criteria. The first of them consists of price, discounts and mounting, transport and embedding, which will be benchmarked with regard to payment

[6] MŽP ČR – ZELENÁ ÚSPORÁM. 2009. List of Qualified Suppliers. Available at: http://www.zelenausporam.cz/vyhledavani/vyhledavani-dodavatele/.

conditions. The second group consists of sub-criteria certification and reference, warranty on windows and program „Zelená úsporám“, which will be benchmarked with regard to quality. The last group consists of frames, profile, colours, hinges and knobs, “, which will be benchmarked with regard to range of products. For each pairwise comparison see Tables 4, 5 and 6.

***Table 4** - Paired comparisons between the criteria of the second hierarchical level with the superior criterion - Payment conditions*

	Payment conditions	**Price**	**Discounts**	**Mounting, transport, embedding**
	Price	1	1/7	3
	Discounts	7	1	8
Frame	Mounting, transport, embedding	1/3	1/8	1

***Table 5** - Paired comparisons between the criteria of the second hierarchical level with the superior criterion – Quality*

	Quality	**Certification and reference**	**Warranty on windows**	**Program ”Zelená úsporám”**
	Certification and reference	1	5	3
	Warranty on windows	1/5	1	1/2
Dis-counts	Program ”Zelená úsporám”	1/3	2	1

***Table 6** - Paired comparisons between the criteria of the second hierarchical level with the superior criterion – Range of products*

	Range of products	**Frames**	**Profile**	**Colours**	**Hinges, knobs**
	Frames	1	1/6	3	2
	Profile	6	1	7	4
Mounting, transport, embedding	Colours	1/3	1/7	1	1/4
	Hinges, knobs	1/2	1/4	4	1

For each of the matrices the consistency ratio has been calculated. The results show that the last matrix, see Table 6, is slightly inconsistent, but the transitivity is violated only slightly and that is the reason why we do not need to change the matrix.

4.4. Determination of weights of criteria and sub-criteria using the AHP

The establishment of weights of the sub-criteria was performed using a publicly available online version of Make It Rational software, which is based on the methodology for calculating the true eigenvector.

First, each criterion was evaluated in terms of supplier selection as stated in Section 4.3. The Quality criterion was found to weigh 0.6348, the weight of Payment conditions is 0.0780 and for Range of products the weight of 0.2872 was calculated. The individual sub-criteria were then analogously evaluated. It is important to realize that when valuating the sub-criterion, the hierarchically superior criteria must be taken into account, which is achieved by multiplying the value of the sub-criteria with the value of relevant criteria, see Table 7.

***Table 7** - The calculated weights of criteria and sub-criteria using the AHP*

Sub-criterion	Found value	Value of the criterion	Weight of sub-criterion v_i
Price	0,153		**0,011934**
Discounts	0,7766	0.078	**0,0605748**
Mounting, transportation	0,0704		**0,0054912**
Certification and reference	0,6483		**0,41154084**
Warranty on windows	0,122	0.6348	**0,0774456**
Program „Zelená úsporám“	0,2297		**0,14581356**
Frames	0,1741		**0,05000152**
Profile	0,6242		**0,17927024**
Colours	0,0566	0.2872	**0,01625552**
Hinges, knobs	0,145		**0,041644**

4.5. Evaluation of alternatives according to actual values of sub-criteria

By step 4.4 the AHP was completed, the aim being to determine the weights of criteria. Now it needs to be determined which of the three examined suppliers is optimal. Collected data and values for calculating the evaluated sub-criteria for the suppliers A, B and C are given in Table 8.

***Table 8** - Collected data of suppliers A, B and C*

Sub-criterion	Supplier A	Supplier B	Supplier C
Price	106 370 CZK	127750 CZK	82474 CZK
Discounts	55 %	52 %	33 %
Mounting, transportation	2250 CZK	0	11520 CZK
Certification and reference	ISO 9001 – yes 28 certified products Positive references – yes	ISO 9001 – yes 41 certified products Certification EKOKOM Positive references - yes	No
Warranty on windows	60 months	60 months	36 months
Program „Zelená úsporám“	YES	YES	NO
Frames	Plastic, aluminium	Plastic, aluminium, wood	Plastic, aluminium
Profile	1 supplier	4 suppliers	3 suppliers
Colours	24 colours	39 colours	38 colours
Hinges, knobs	MACO	MACO	WINKHAUS

Because among the sub-criteria there are criteria of qualitative and quantitative, cost and yield type present, it is necessary to convert qualitative criteria into numerical terms (based on the evaluation of a business owner). Values of cost type will be highlighted. For Performing, see Table 9.

Table 9 - Converting values of sub-criteria into a numerical mark

Sub-criterion	**Supplier A**	**Supplier B**	**Supplier C**
Price	**106 370**	**127 750**	**82 474**
Discounts	55	52	33
Mounting, transportation	**2250**	**0**	**11520**
Certification and reference	28	45	0

Warranty on windows	60	60	36
Program „Zelená úsporám“	1	1	0
Frames	2	3	2
Profile	1	4	3
Colours	24	39	38
Hinges, knobs	4	4	2

4.6. Normalization of the values of sub-criteria

Due to the different natures of evaluated sub-criteria, it is necessary to normalize the collected values so that they are ranged in the interval <0, 1>. It is possible to use several methods (Minkowski's method, Euclidean method, the Chebyshev method, etc.) for the normalization. The Euclidean normalization is used in this article, see Appendix 1. Normalized values of the sub-criteria using the Euclidean normalization technique are in Table 10.

***Table 10** - Normalized values of the sub-criteria using the Euclidean normalization technique*

Sub-criterion	Supplier A	Supplier B	Supplier C
Price	0,4268	0,3116	0,5556
Discounts	0,6661	0,6298	0,3997
Mounting, transportation	0,8083	1,0000	0,0185
Certification and reference	0,5283	0,8491	0,0000
Warranty on windows	0,6509	0,6509	0,3906
Program „Zelená úsporám“	0,7071	0,7071	0,0000
Frames	0,4851	0,7276	0,4851
Profile	0,1961	0,7845	0,5883
Colours	0,4033	0,6554	0,6386
Hinges, knobs	0,6667	0,6667	0,3333

4.7. Selection of the optimal supplier

Once we determine the weights of particular sub-criteria v_i and know the partial evaluation of a given variant regarding chosen sub-criterion h_{ij}, we can accede to total evaluation of the variants according to appropriate relationship modification (11).

We only change this relationship (12), which is necessary due to use of normalized values of sub-criterion. The variant with the highest evaluation of H_j is considered to be optimal, see Table 11.

$$H_j = \sum_{i=1}^{n} v_i \cdot h_{ij}, \qquad j = 1, 2, ...m, \tag{12}$$

where: H_j is the total value of the j-th variant, v_i is the weight of the i-th criterion, h_{ij} is a partial evaluation of the j-th variations due to the i-th criterion, n is the number of criteria, m is the number of variant.

***Table 11** - Final evaluation of suppliers using the AHP and Euclidean method of normalization*

Sub-criterion	Supplier A	Supplier B	Supplier C	Weight of subcriterion v_i	$v_i \cdot h_{ij}$ Supplier A	Supplier B	Supplier C
Price	0,4268	0,3116	0,5556	**0,011934**	0,005093431	0,003718634	0,00663053
Discounts	0,6661	0,6298	0,3997	**0,0605748**	0,040348874	0,038150009	0,024211748
Mounting, transportation	0,8083	1	0,0185	**0,0054912**	0,004438537	0,0054912	0,000101587

Sub-criterion	Supplier A	Supplier B	Supplier C	Weight of subcriterion v_i	$v_i . h_{ij}$ Supplier A	Supplier B	Supplier C
Certification and reference	0,5283	0,8491	0	**0,41154084**	0,217417026	0,349439327	0
Warranty on windows	0,6509	0,6509	0,3906	**0,0774456**	0,050409341	0,050409341	0,030250251
Program „Zelená úsporám“	0,7071	0,7071	0	**0,14581356**	0,103104768	0,103104768	0
Frames	0,4851	0,7276	0,4851	**0,05000152**	0,024255737	0,036381106	0,024255737
Profile	0,1961	0,7845	0,5883	**0,17927024**	0,035154894	0,140637503	0,105464682
Colours	0,4033	0,6554	0,6386	**0,01625552**	0,006555851	0,010653868	0,010380775
Hinges, knobs	0,6667	0,6667	0,3333	**0,041644**	0,027764055	0,027764055	0,013879945
SUM					**0,514542515**	**0,765749812**	**0,2151753**

The highest value was reached by supplier B, who can therefore be considered as the best windows supplier according to the AHP.

It is appropriate to emphasize that the AHP takes into account all the criteria and also their weights. The selected supplier may therefore not be the best in terms of all the criteria, but should be very good in terms of the criteria which have the highest weight. The selected supplier B has for example the highest price, but the weight of this sub-criterion is very small, on the contrary, in terms of certifications and references, which have the highest weight, has the best evaluation.

Conclusions

The AHP is a powerful and flexible tool for solving complex multi-criteria decision making problems that involve both quantitative and qualitative aspects. It can be applied in a wide variety of situations, such as supplier selection, technology selection, planning and design, risk modelling, selection of warehouse, logistics service provider, etc.

Although the mathematical description of the method of AHP is complicated, with the use of appropriate software tools that are designed for this method, it is an effective, simple and fast tool for the assessment of criteria and selection of the optimal variant.

Although the pairwise comparisons of criteria are somewhat subjective, the requirements for consistency of decision matrices provide a relatively high transitivity. Another limitation of this method is the requirement for a set of criteria, where each criterion should not interfere with another, none should be purposely overestimated and their list should be full, but not too broad, all of which may be sometimes difficult in practice.

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APPENDIX 1.

Euclidean metric - method of normalization

For the calculation of the normalized values by Euclidean metric has been created the formula

$$h_{ij} = \frac{y_{ij}}{\left(\sum_{j=1}^{p}\left(y_{ij}\right)^2\right)^{1/2}}, \quad i = 1,2,\ldots p,\ j = 1,2,\ldots, k. \tag{13}$$

In the case that we normalize criterion of cost type is appropriate to modify the above relationship to

$$h_{ij} = 1 - \left(\frac{y_{ij}}{\left(\sum_{j=1}^{p}\left(y_{ij}\right)^2\right)^{1/2}} \right), \quad i = 1,2,\ldots p,\ j = 1,2,\ldots, k. \tag{14}$$

The successive calculations of the normalized values are located in Table 12 and 13.

Table 12 *- The successive calculations of the normalized values*

Subcriterion	Supplier A	Supplier B	Supplier C	A^2	B^2	C^2	$A^2+B^2+C^2$	$(A^2+B^2+C^2)^{1/2}$
Price	106370	127750	82474	11314576900	16320062500	6801960676	34436600076	185571,0109
Discounts	55	52	33	3025	2704	1089	6818	82,57118141
Mounting, transportation	2250	0	11520	5062500	0	132710400	137772900	11737,67013
Certification and reference	28	45	0	784	2025	0	2809	53
Warranty on windows	60	60	36	3600	3600	1296	8496	92,17374897
Program „Zelená úsporám“	1	1	0	1	1	0	2	1,414213562
Frames	2	3	2	4	9	4	17	4,123105626
Profile	1	4	3	1	16	9	26	5,099019514
Colours	24	39	38	576	1521	1444	3541	59,50630219
Hinges, knobs	4	4	2	16	16	4	36	6

Table 13 *- Normalized values according to the Euclidean metrics*

Sub-criterion	Supplier A	Supplier B	Supplier C
Price	0,4268	0,3116	0,5556
Discounts	0,6661	0,6298	0,3997
Mounting, transportation	0,8083	1,0000	0,0185
Certification and reference	0,5283	0,8491	0,0000
Warranty on windows	0,6509	0,6509	0,3906
Program „Zelená úsporám“	0,7071	0,7071	0,0000
Frames	0,4851	0,7276	0,4851
Profile	0,1961	0,7845	0,5883
Colours	0,4033	0,6554	0,6386
Hinges, knobs	0,6667	0,6667	0,3333

A STUDY ON SAVINGS AND INVESTMENT PATTERN AMONG SALARIED PERSONS IN TRICHY CITY

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Abstract

Savings play a vital role for protecting an individual and for the development of an economy. Savings may be invested in the form of fixed deposits, gold/silver, real estate, stock market & insurance policies. After government withdrawal of the scheme of provident fund for their employees the need for savings for government employees has increased manifold. Central Government has established new pension scheme in which public can contribute and fund gives a guaranteed return to the subscriber .The researcher has analysed the attitude of the employees towards savings and their preference towards various types of investment For the purpose of analysis statistical tools such as correlation and factor analysis are used The finding of the study shows that majority of the people save nearly 20% of their income and their first investment option is bank deposit and less preference is given for shares and real estate.

Key words: savings, attitude, investment, factor analysis.

JEL Classification: D14, E21

1. Introduction:

Savings plays a vital role for the economic development of any nation As per the statistics released by Reserve bank of India house hold savings had increased from 18,329.01 INR Billion to 20,037.20 INR Billion, but at the same time saving as percentage of GDP had come down from 36.8 to 30.1 savings must be invested in a proper form otherwise investors may lose capital and return may not be adequate to meet the inflation It is generally stated that risk and return moves in the same direction, but at the same time highly risky asset may reward a negative return also. Investor must be highly careful while choosing their portfolio .Their investment pattern depends upon certain key factors such as risk, liquidity etc. for salaried employees their income level is fixed they can plan their income and expenditure pattern and they can save accordingly salaried person can channelize their savings in different types of investments such as fixed deposits, post office savings, real estate, insurance policies, stock market securities, gold and silver.

2. Literature review:

Vickie L. Bajtelsmit, Alexandra Bernasek (1996) observes about the gender difference arises while choosing the investment options and about the risk taking capacity out of their investments. Marie- Therese Nga (2007) observes household savings of South Africa and identifies main factors responsible for lack of savings in poor households. Gaurav kabra, Prashant Kumar Mishra, Manoj Kumar Dash (2010) reveals about the factor that influence investment behaviour and about the decision of investment on the basis of demographic variable. Author concludes that age and gender variable mainly decides the investment behaviour of the investors. L. Pandiyan, Dr. T. Aranganathan (2012) observe seven underlying dimensions of savings/investments. Using factor analysis the author finds that respondent have high attitude towards all aspects expect Tough Task but good for future. Prof. C. A.Yogesh, P. Patel, Prof. C.S. Charul Y. Patel (2012) reveal about the investment behaviour of salaried people working in private sector and about different perception while choosing the alternative investment options. This study as a result concludes that the younger generation most preferred to invest their money in mutual fund to get a reasonable return than traditional investments like post office and fixed deposits. Dr. V. Ramanujam, K. Chitra Devi (2012) analyzed the impact of

socio economic variable that influence the investor towards investments and concludes that income level of the investor highly influences the investment decisions of individual. Dr. Aparna Samudra, Dr. M.A. Burghate (2012) found that income and age group of the people decides the investment preference of middle class people in Nagpur. Meenakshi Chaturvedi, Shruti Khare (2012) identified various investment options available for investments and finds the impact of demographic variable on various investment avenues and finaly identifies the factor that influences the investor awareness and preference on various products. Mrs. K. Parimala Kanthi, Dr. Ashok Kumar (2013) study about the investment behaviour of individual on financial investments and various alternative options chosen by the investors. V. R. Palanivelu, K. Chandrakumar (2013) observe briefly about the investment avenues available for investments and concludes that education level, awareness about the financial investment and age as a demographic variable plays a important role while deciding the investment avenues. R. Sreepriya, P. Gurusamy (2013) observes mainly on safety, liquidity, profitability on investments and tax benefit while they invest and about the problem of the investor while choosing the investment options. S. Umamesheswari, Dr. M. Ashok Kumar (2013) reveals that demographic variable influences the saving attitude of salaried persons and it was observed that lack of awareness on investment option is reason that affects the investment behavior of individual.Mrs.Vasanthi, Mrs.P.Usha (2014) observes the attitude of salaried person towards savings and finds that government employees mainly invest for tax reduction purpose and private employees highly contribute their funds towards provident fund.

Statement of the problem

Government employees in India are not covered under the statutory pension scheme. As a result, employees are forced to save a part of the salary income to meet contingencies that may arise after retirement .There are number of investments schemes promoted by LIC ,government of India and by the banking sectors. The employees will have to take calculated risk before deciding investment options. Though there are number of investment options available to investors salaried persons always prefer safety and liquidity as a prime factor in choosing the investment options. When safety and liquidity are given prime importance rate of return may not match with the inflation index, hence the employees are facing the problem of choosing an investment option with the high return, but the risk involved will be also very high.

On the basis of the problems mentioned above the following objectives are framed.

Objectives of the research

1. To identify the savings attitude of salaried persons in trichy city.
2. To know the investment preference of the salaried persons.
3. Identify the saving habit of salaried persons across the demographic variable.
4. Factors which influences the investment pattern of salaried persons.

Limitations of the research

1. The study shall be limited to salaried persons.
2. The study is based on the data collected from the sample population collected from trichy city, hence the conclusion cannot be generalized.

Research methodology

Primary data is collected with help of detailed questioner by adopting survey method for the purpose of collection of data 300 respondent were contacted by the researcher by using convenient sampling. Researcher has applied tools such as Percentage analysis, Cross tabulation, Correlation, factor analysis in this research work to meet out the study objectives.

Research hypothesis

1. People generally prefer bank deposits as safe form of investments;
2. Investment in mutual fund and equity is least preferred;
3. Age has got significant impact on savings habit;
4. Occupation and income is having good correlation in different forms of investment;
5. Investors are aware of interest offered by bank;

6. Information provided in news papers and magazines are having significant impact on savings habit;
7. Tax benefit is an influencing factor for savings.

Results and discussions

The researcher had collected data from 300 employees at trichy town. In Table 1 respondents profile is presented.

Table 1 -Respondent profile

Respondent details		
Age	**Frequency**	**Percentage**
25-35	**114**	**38**
35-45	**104**	**34.7**
45-55	**17**	**5.7**
Above 55	**65**	**21.6**
Total	**300**	**100**
Savings Gender		
Male	**263**	**87.7**
Female	**37**	**12.3**
Total	**300**	**100**
Qualification		
Under graduate	**73**	**24.3**
Graduate	**116**	**38.7**
PG	**76**	**25.3**
Professional	**35**	**11.7**
Total	**300**	**100**
Occupation		
Private sector	**187**	**62.3**
public sector	**29**	**9.7**
Government	**84**	**28**
Total	**300**	**100**
Income		
Below Rs 2,00,000	**63**	**21**
Rs 2,00,000-4,00,000	**164**	**54.7**
4,00,000-6,00,000	**60**	**20**
Above 6,00,000	**13**	**4.3**
Total	**300**	**100**
Earning member		
One	**207**	**69**
Husband &wife	**56**	**18.7**
Father&son	**12**	**4**
Mother&son	**25**	**8.3**
Total	**300**	**100**
Savings	**Frequency**	**Percentage**
Regular	**264**	**88**
Occasional	**36**	**12**
Total	**300**	**100**

Sources: primary data

From the above table we can state that 38% of the sample population represent the age group 25-35,34.7% in the age group 35-45,5.75 of 45-55 and 21.6% represents age group above 55.Further the sample provides the information that 87.7%represents of the respondents are from male population & 12.3% represents female segment. As regards qualification 24.3% are under graduate, 38% are graduated, 25.3% post graduate & 11.7% are professionally qualified. With reference to occupation the sample data reveals the fact that 62.3% are from private sector, 9.7% from public sector & 28% from government undertakings. As regards income 21% represents annual income below 2 lakhs, 54.7% between 2-4 lakhs, 20% between 4-6 lakhs and 4.3% above 6 lakhs. As regards earning members 69% of the sample population depends upon only one sources of income where as remaining sample data represents the combination of husband & wife or father & son or mother & son. It is interesting to note that 88% of the sample population is having regular practice of savings from their salaried income.

Reasons for savings:

There may be humpty number of reasons for savings by a salaried person. However for the purpose of research the researcher has identified the following factors such as Post retirement, Tax reduction Medical expenses, Children education, Son or daughter marriage, Purchase of an asset and for generating regular income and Savings without purpose. In Table 2 Respondent opinions for savings in terms of different types of investment is presented.

Table 2 - Respondent opinion on key factors (In percentage)

Reasons for savings	Deposits	post office savings	Mutual fund	Equity	Insurance	Real estate	Gold /silver
Post retirement	**78.66**	**3**	**4.33**	**-**	**11.33**	**-**	**2.66**
Tax reduction	**11**	**2**	**6.33**	**10.66**	**69.66**	**0.33**	**-**
Medical expenses	**52.33**	**1.33**	**-**	**-**	**46.33**	**-**	**-**
Children education	**86.33**	**-**	**0.66**		**13**	**-**	**-**
Son or daughter marriage	**80**	**1.33**	**0.7**	**0.7**	**14**	**3**	**0.3**
Purchase of asset	**60**	**3**		**-**	**0.7**	**20**	**16.3**
Regular income	**88**	**3.7**	**1.3**	**-**	**1**		**6**
Savings without purpose	**76.3**	**2.3**		**0.7**	**15.7**	**2.3**	**2.7**

Sources: Primary data

From the table we can say that people prefer mainly bank deposits compared to other types of investments. In the case of meeting children education, son or daughter marriage & to meet post retirement contingencies people consider deposit is the safe form of investment. The table also reveals the fact that people are not comfortable in post office savings. As regards mutual fund only 6.3% of the sample population prefers to invest for tax reduction & they don't want to risk their money in investing in mutual funds and in stock market.

From the point of tax reduction people prefer insurance rather than other types of investments. With reference to real estate18.7% of the sample population prefer to invest it so that they will get better return. As regards gold/silver it is very interesting to note that 16.3% of the population prefers to buy it for the purpose of purchasing future assets.

Investor awareness:

Risk & return always goes in the same direction. If an investor prefers to take risk he will be able to get higher return but at the same time there is a risk of losing his capital. For investing in stock market investor may do both fundamental and technical analysis. Even in the case of fixed deposits bankers are offering different interest rates. Similarly with regards insurance there are different types of policy & schemes which insured had to choose to suit their requirements. Investing money in real estate is not an easier affair; investor must be familiar with risk involved & numbers of legal

formalities. As regards gold/silver, since prices are widely fluctuating & quality of the product also differs from shop to shop, investor must be very careful while investing. In Table 3 investors knowledge to different types investments are presented.

Table 3 -Investor knowledge in different types of investment (In percentage)

Source: Primary data

Investment experience	Beginning	Moderate	Knowledgeable	Not Interest	No Awareness
Deposits	**10**	**15.7**	**74.3**	**-**	**-**
Post office savings	**5**	**64.3**	**27**	**3.7**	**-**
Mutual fund	**24.3**	**3**	**6.3**	**54.3**	**12**
Equity	**7**	**1.3**	**1**	**78**	**12.7**
Insurance	**5**	**70.3**	**20.3**	**4.3**	**-**
Real estate	**17.7**	**15.3**	**2.7**	**64.3**	**-**
Gold /silver	**7**	**69**	**16**	**7**	**-**

From the above table we can conclude that majority of the respondents are clear about bank deposits and they are not much interested in gaining knowledge in field of mutual fund, equity market & real estate. Similarly moderate knowledge is observed in the field of insurance, post office savings & gold/silver. It is quite obvious that insurance policies are taken on the advice given by insurance agent & investor are not completely studying different types of policies. As regards post office savings their knowledge is not up to the mark.

Saving percentage on salary:

It is a general practice of salaried employee to set a part, portion of their salary for savings purpose. In the Table 4 savings percentage on salary is presented:

Table 4 -Savings Percentage on Salary

Percentage of savings	Percentage
1-10%	**17.3**
11-20%	**79**
21-30%	**2**
Above 30%	**1.7**

Source: Primary data

Nearly 80% of sample population saves nearly 11-20% of salaried income, 17.3% of sample population prefers to save 1-10%, 2% of sample population save 21-30% & hardly 1.7% of the sample respondents are saving above 30% of their salary. Hence we can state nearly 80% of sample population is having the habit of providing 20% of their salary to meet future contingencies.

Correlation:

It is better to find out any significant relationship between income, qualification and occupation with a form of investment. In the Table 5 correlation analyses are presented.

Table 5 - Correlation between income, occupation and qualification with types of products

Correlation	Deposits	Post office savings	Mutual fund	Insurance	Real estate	Gold /silver	Equity
Income	0.436	0.214	-0.182	0.531	-0.063	0.367	-0.148
Occupation	0.245	0.116	0.178	0.63	-0.015	0.198	-0.123
Qualification	0.047	-0.086	0.135	-0.617	0.206	0.124	0.059
Correlation	Deposits	Post office savings	Mutual fund	Insurance	Real estate	Gold /silver	Equity
Income	0.436	0.214	-0.182	0.531	-0.063	0.367	-0.148
Occupation	0.245	0.116	0.178	0.63	-0.015	0.198	-0.123
Qualification	0.047	-0.086	0.135	-0.617	0.206	0.124	0.059

Source: Primary data

Income has got a positive correlation with deposits, insurance, gold/silver and post office savings. It has got a negative correlation between mutual fund and equity. The correlation is slightly high in deposits and insurance where as it is just 0.2% in case of post office savings and 0.3% for gold and silver. It is very much clear that income has got low impact with regards to mutual fund and equity investments. It shows that people are allergic towards investment in mutual fund and equity market irrespective of their income level.

As regards occupation, correlation with insurance level is fairly high compared to other types of investments; occupation has negative correlation with regards to real estate and equity investments. As for as qualification is concerned except post office savings and insurance all other factor are having good relationship. It is strange to note that insurance product is having negative relationship with qualification that means there is no impact of qualification on insurance.

Factor analysis:

For the purpose of understanding investment pattern adopted by salaried persons 35 variables where identified which are mentioned: 1) Saving money for secured life, 2) Always having inner urge to make additional save for better future, 3) Cut the expenses for savings, 4) invest to meet emergency needs, 5) capital growth is the reason for investment, 6) consider tax benefit as a prime factor in savings, 7) Investment in long term bond. mutual fund, 8) fixed deposit and PPF is preferred, 9) Return on investment is also considered, 10) Now a day's habit of savings is not properly taught to children, 11) Savings is the inborn habit to many people, 12) Present wants reduces the savings, 13) Savings is tough task but it is a must be done, 14) Save today smile tomorrow is mantra for salaried people, 15) Government should create awareness among the investors, 16) Government securities are not attractive because of low yield nature, 17) Having good knowledge of investment plans, 18) Having better knowledge about the schemes, 19) Return is not an issue, 20) Tax benefit is not an issue, 21) Risk taking is not an issue, 22) Minimum guarantee is sufficient, 23) Bad times in investing practices, 24) Safety of investment has no compromise, 25)Take suggestion from relatives, 26) Suggestion from peers, 27) Professional, 28) Journal, 29) Newspaper, 30) protection from inflation is the reason for investment, 31) Like to invest more than 5 years, 32) Take suggestion from financial advisor before investment, 33) Below one year, 34) 1-5 years, 35) Above 5 years.

The statement listed above describes the factors that may be perceived by the investors. Investor's opinion collected with five point scale ranging from least preferred to most preferred. Factor analysis is applied to find out important factors which are having a direct link with the perception of the investors.

For the purpose of validity in the collected data KMO test and Barlett's test was applied and the results are presented below.

Table 6 - KMO and BARTLETT'S TEST

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.653
Bartlett's Test of Sphericity	Approx. Chi-Square	1.647.00
	Df	45
	Sig.	0.000

Source: Primary data

The KMO value is 0.653 which signifies that the factor analysis is useful with the data. The chi Square value for Bartlett's test of Sphericity is 1.647 and the significant value is 0.0000 which is significant. This means data are very suitable for factor analysis

Communalities:

Out of 35 factors only 10 factors have been extracted for the purpose of analysis. Communalities which measure the percent of variance and it can be interpreted as reliability of the indicator. The table given below shows how much of the variance in the variable has been accounted for in the extraction factor.

Table 7 - Communalities

Communalities		
	Initial	Extraction
Secured life	1	0.515
Return on investment is also considered for tax	1	0.679
Good knowledge of investment plan	1	0.816
Good knowledge of Financial plan	1	0.785
Better knowledge about the Schemes	1	0.854
Return is not an issue	1	0.839
Minimum guarantee is sufficient	1	0.838
Take suggestion from relatives	1	0.581
Journal	1	0.931
Newspaper	1	0.938
Extraction Method: Principal Component Analysis.		

Source: Primary data

The above table shows that 93.8% of the variance is found in standard norms for gathering knowledge from news paper while 93.1% of variance is found gathering information from journal is preferred by the investor while investing. 85.4% of variance is found investor has better knowledge on schemes when they make investment. 83.9% of variance is found return is not preferred while they make investment on their will. 83.8% of variance is found minimum guarantee is needed by the investor on their investment. 81.6% of the variance is found investor have better knowledge on the investment plan. 78.5% of the variance is found that they are able judge their savings pattern. Extraction communalities are estimates of the variance in each variable accounted by the factors in factor solution.

Table 8 - Factors with percentage of variance explained

Factor	Eigen value	Percentage of total variance	Cumulative %
Awareness	6.727	34.37	34.37
Knowledge gathering	2.509	20.36	54.74
Habit	0.517	12.51	67.26
Tax benefit & Security	0.249	10.508	77.77

Sources: Primary data

With help of factor analysis we are able to reduce 35 variables to 10 variables then it is further reduced to four important components.

Table 9 - Awareness

Variable	**Factor loading**
Better knowledge about schemes	0.8865544
Good knowledge of investment plan	0.8836759
Good knowledge of financial plan	0.824182
Take suggestion from relatives	0.6327253

Sources: Primary data

The above table shows that the factor contains variables related to the purpose of Investors. These are the major factor that influences decision of investors while investing. According to the researcher analysis awareness plays a major role because the investor should have a better knowledge on his investment to get a better return.

Table 10 - Knowledge gathering

Variable	**Factor loading**
Newspaper	0.94553
Journal	0.94388

Sources: Primary data

This factor variable brings out an important concept that the investors always collect some opinion from various sources before making investments.

Table 11 - Habit

Variable	**Factor loading**
Return is not an issue	0.8682
Minimum Guarantee is sufficient	0.84354

Sources: Primary data

This factor contains variables related to habit, as investor consider return is not very important but prefers to get minimum guarantee on his savings.

Table 12 -Tax benefit & secured life

Variable	**Factor loading**
Return on investment is also considered for tax benefit	0.7723
Secured life	0.62057

Sources: Primary data

This factor contains related to tax benefits and secured life on Investment. This analysis shows that the investor mostly prefer tax benefit along with a minimum return. As a conclusion the factor analysis is done on major component which influences the investor decision investment.

In the factor analysis we can conclude there are four components such as awareness, knowledge gathering, habit and tax benefit and secured life are deciding factors influencing the saving habits of salaried person.

Findings:

On the basis of the analysis the following findings are made:

- Majority of the sample population consider bank deposits and insurance as a safe form of investment;
- Equity and mutual fund are least preferred;
- To meet the retirement contingencies, medical expenses, children education, son or daughter marriage, purchase of asset, to generate regular income people consider bank deposit as safe form of deposit;
- Insurance policy are take mainly for tax reduction and for medical expenses;
- People are having awareness about different types of deposit offered by the bank;
- As regards insurance only moderate knowledge among sample population are noticed;
- People are not that much interested in diverting their savings towards real estate;
- Nearly 80% of the sample population prefer to save 11-20% of their salary;
- Bank deposit is preferred by people with different age groups, were as post office scheme is preferred by people in the age group of 25-35 and 35-45;
- As regards mutual fund it is not preferred by all age groups;
- Insurance products are highly popular among age bracket of 35-45;
- As regard to real estate least preference is noticed among all the segment of the sample population except the age group of 45-55;
- Income has got a positive correlation with deposits, insurance gold/silver and post office savings. It has got a negative correlation with equity market;
- Occupation has got negative correlation with equity investment;
- As far as qualification is concerned expect post office savings and insurance all other has good relationship;
- Factor analysis has revealed that there four important components such as awareness, knowledge gathering, habit and tax benefit and secured life is an influencing factor for savings**.**

Conclusion

Bank deposit is considered as a safe form of investment by the employees working in both private sector and public sector. Banker should concentrate on mobilizing savings so that it can be utilized for nation building activities. The study also reveals that the risk appetite is very low and the investors are more conservative. Debt instruments can be popularized so that fixed rate return is guarantee to investors. Insurance companies can also launch innovative policies with guaranteed return.

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ANALYSIS OF TAX SYSTEMS IN SLOVAKIA, HUNGARY AND CZECH REPUBLIC AND THE TAX HARMONIZATION IN EUROPEAN UNION

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Abstract:

In the article we would like to point out the similarity respectively the diversity of tax systems in selected countries of Central Europe. We analyzed the structure and amounts of collected taxes in Slovakia, Hungary and Czech Republic. This analysis should be the starting point for considering the possibility of direct tax harmonization in the EU. The article also deals with the nature, conditions and future of direct tax harmonization in European Union. The objective was to assess the feasibility of full direct tax harmonization in the EU. We used the cluster analysis method to outline possible options for implementing this process in Member countries. The article also includes the opinions of experts and stakeholders on this issue.

Keywords: personal income tax, corporate tax, VAT, excise taxes, tax harmonization, cluster analysis.

JEL Classification: H2, H71, C88

1. Introduction

State tax policy takes into account the process of convergence and unification of Europe. In connection with efforts to create a single market, there is a tax coordination of EU countries, i.e. the effort to create a certain treaty base, which serves as a basis for synchronization of individual tasks and activities in the field of taxation.

The greater coherence of European Union allows taxpayers transfer their activities to countries with lower taxes. Therefor there is reflected an effort to tax approximation and tax harmonization of tax systems in the European Community. This process is not easy; it requires application of certain tax tolerance and adaptation.

For fiscal theory and practice are known different definitions of tax. In general, tax can be characterized as mandatory, legally established, non-equivalent, usually recurring payment paid by taxpayers to the state in a specified amount and on time. From an economic point of view, tax is an instrument for redistribution of national income through public funds (state budget, budgets of Higher Territorial Units, and budgets of municipalities) (Schultzová 2011, 30)

2. Tax systems of Slovakia, Hungary and Czech Republic

In the literature we often meet with the breakdown of taxes on direct and indirect. (Korečko and Suhányiová 2012) This breakdown takes into account the impact of taxes on taxpayers who bear the tax liability directly or indirectly:

- Direct taxes are levied directly, immediately on the income or assets of taxpayer. Paying is not move to another entity; taxpayer pays them directly, while the amount of tax liability reflects payers' income or financial situation.
- Indirect taxes are levied at a certain level of production, respectively at sale of goods or services. However their impact eventually moves on to the final consumer who pays the tax in the price of purchased product or service.

In tax systems of selected EU countries are often such indirect taxes, which are in some countries referred as fees (e.g. tax on gaming betting and lotteries, etc.). To indirect taxes in the great majority of Member States belong also: green taxes, respectively environmental taxes levied on the

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consumption of goods or materials that are found in limited quantities or that pollute the environment; for example electricity tax, tax on waste, packaging tax, tax on coal, the CO_2 tax etc.

By comparing of national taxation systems the tax means all tax levies shown in the taxes classification according to the OECD methodology. (Široký 2012, 23-62) Taxes are divided into six main groups:

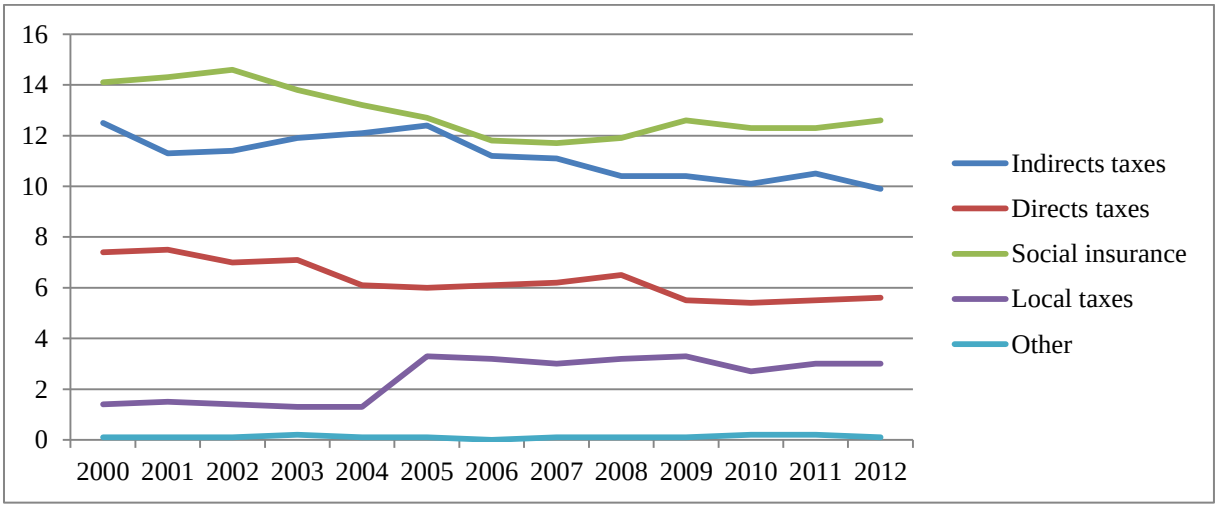
- Taxes on income, profits and capital gains;
- Social security contributions;
- Taxes on payroll and workforce;
- Taxes on property;
- Taxes on goods and services;
- Other taxes;
- Each of these groups contains other subgroups.

The following paper contains a brief analysis of three neighboring tax systems and historically close Member States of the EU: Slovakia, Hungary and Czech Republic. The data to compare essential features of tax systems and the development of individual tax rates were drawn from EUROSTAT databases, tax directorates, public health insurance and social insurance and from countries individual laws (more in the references). Custom text is structured according to the following categories of taxes:

- direct income taxes (personal income tax, corporate income tax, social insurance) and direct property taxes;
- indirect taxes;
- social security contributions.

Slovakia – structure and development of tax revenues

Slovakia is a multiparty state with a unicameral Parliament and a President. From the territorial and administrative point of view, Slovakia is divided into 8 regions, 79 districts, 3071 towns and villages. (Úrad vlády Slovenskej republiky) Slovakia joined the European Union on 1 May 2004 and with effect from 1 January 2009 was introduced the currency euro.



Source: Processed according to Eurostat

Figure 1 - Development of tax revenues in Slovakia by species taxes as % of GDP

The tax system of Slovakia is legislative determined by Law on Income Tax, Law on Value Added Tax, six Acts on excise taxes and the Law on local taxes and local fee for municipal waste and construction waste. Among important contributions of fiscal nature are included in particular the social insurance and health insurance. Slovak tax system in force until 2004 consists of two type income taxes - personal income tax and corporate income tax. The tax base of individuals in 2004 was taxed at modulating progressive tax rate, which ranged from 10% to 38%. Corporate revenues were in 2000 and 2001 taxed by linear tax rate of 29%, in 2002 and 2003 by tax rate of 25%.

Slovak tax system reform in 2004 was fundamental reform, which was launched in the year of entrance Slovak Republic into the European Union. Slovak governments' intention was to create one of the most competitive systems within the EU and the OECD. Thanks introduction of flat tax Slovakia recorded a positive response from foreign countries and from the OECD. Slovakia was the first country from the OECD member countries and later also in the Euro area, which has introduced such a tax. Introduction of a flat income tax has been linked to an immediate large shortfall of state budget revenues. Applied was the linear tax rate of 19% for taxation of personal and corporate incomes. Through its adoption were eliminated 21 different types of income taxation. Double taxation of profits was removed through elimination of taxation on dividends. Abolished have been also inheritance tax, gift tax and tax on transfer of real estate. The failure of direct taxes was offset by uniting VAT rate to 19% and by an increase of some excise taxes.

Since 2013, the flat income tax has been disturbed. Corporate tax rate is currently 23%. The personal income tax rate is 19% on that part of tax base, which not exceeds 176.8 times the amount of current subsistence and 25% on that part of tax base, which exceeds 176.8 times the current subsistence. The tax base can by modify of tax allowance - an item that can reduce the basis for assessment of the tax itself. This amount is calculated annually as 19.2 times the subsistence minimum. In 2009 and 2010 under the Governments measures to mitigate impact of global crisis was reduced the tax burden through increasing the tax allowance, which was changed to 22.5 times the subsistence minimum. Since 2011 it is again like before 2009. In 2014 the tax allowance for taxpayer is 3,803 euro. (Act no. 595/2003 on Income Tax, Act no. 366/1999 on Income Tax, Act no. 286/1992 on Income Tax)

To the Act on Income Tax in 2011 was amended tax on emission quotas to get some financial resources to the state budget. The tax rate was set at 80% of the value of unused and sold emission quotas. This tax was canceled in 2012.

Value added tax is an indirect tax that affects mostly final consumer as it is part of the exercise price. The standard VAT rate in 2002 was 23% and reduced tax rate 10%. Since 2003, the standard rate was reduced from 23% to 20 and reduced tax rate increased from 10% to 14%. The tax reform in Slovakia from 1 January 2004 greatly touched also VAT because reforms objectives included the introduction of 19% tax rate and shift the tax burden from direct to indirect taxation. Slovakia has become that way one of the five European states, where didn't exist standard and reduced tax rate together. The introduction of 19% VAT rate has affected prices of all goods and services especially that under reduced rate of tax. They were mostly food, medicine, energy, supply of structures, structures works, books, newspapers, magazines, hotel and restaurant catering services. It was assumed that reduced VAT rate will generate lower prices, leading to better availability of basic food and other selected items for low-income groups, or increase consumption of goods that are considered as socially desirable. But the practice didn't confirm these expectations. The 10% reduced VAT rate has been reintroduced on 1 January 2007, and its use is limited to books, medicines, pharmaceutical products and selected medical devices. From 2011 the standard VAT rate increases from 19% to 20%. (Act no. 222/2004 on Value Added Tax, Act no. 222/1992 on Value Added Tax)

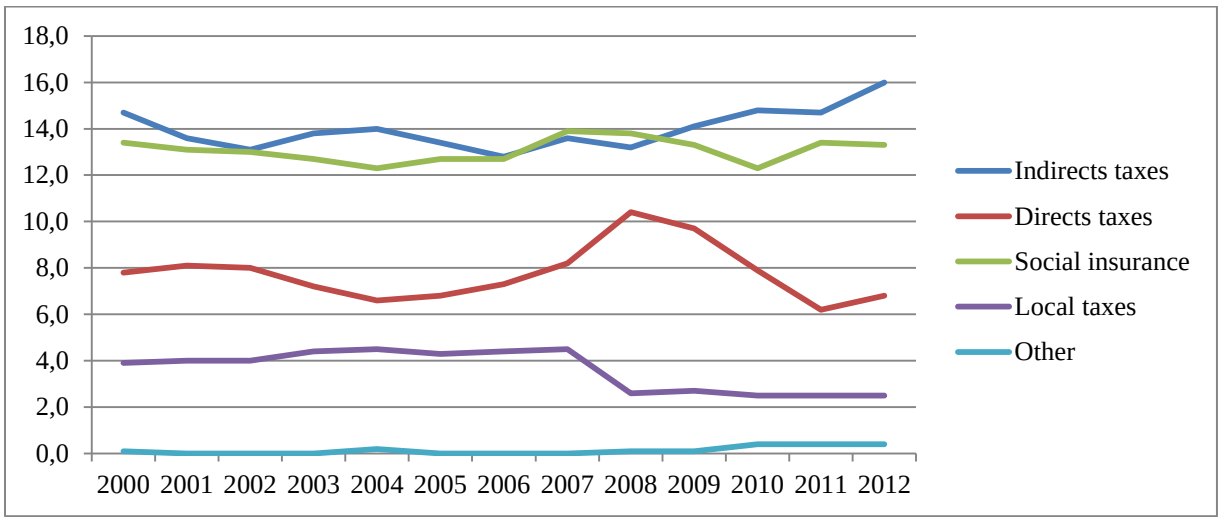
Excise taxes are selective indirect taxes, which apply only to particular type of goods. In Slovakia these goods are alcoholic beverages (spirits, wine, beer), mineral oils, tobacco products and from 1 July 2008 the electricity, coal and natural gas. Since 2001 the revenues from excise duties recorded annual growth. Since 2004, the tax rates for excise taxes increased slightly above the minimum rates required by the European Union. In 2009 there was a slight decrease in revenues from excise taxes. It can be justified mainly by the economic crisis and related decline in consumption of products subject to excise duties. Among all excise taxes, which are introduced in Slovakia, the largest share of the annual state budget income has the excise tax on mineral oil. This tax represented each year more than 50 percent share of total state budget revenues from excise taxes. Excise taxes are single-stage taxes, levied at one stage, in principle upon extraction of selected goods from manufacturer. Excise taxes are administrated by Customs Authorities. (Act no. 530/2011 on alcoholic beverages, Act no. 609/2007 on electricity, coal and natural gas, Act no. 106/2004 on tobacco products, Act no. 98/2004 on mineral oil, Act no. 105/2004 on alcohol)

The current system of local taxes in Slovakia was influenced by the decentralization process of public administration, in particular by the process of fiscal decentralization, which resulted in the new system of financing local government from 1 January 2005. (Hudec 2009) By own local taxes

increased tax jurisdiction of towns and villages in determining real estate taxes. Local fees were translated into local taxes and budgetary determine of road tax was changed. Road tax was transformed into a motor vehicle tax and became part of the revenues of Higher Territorial Units budgets. Act on local taxes determines which tax may be levied by local self-government, with a precise definition of individual taxes following to municipalities and Higher Territorial Unit. Local taxes are facultative, i.e. municipalities and Higher Territorial Unit may or may not introduce these taxes according to local conditions as a generally binding regulation. Local taxes are: the real estate tax, tax on dogs, tax on public space, tax for accommodation, tax on vending machines, tax on non-winning gaming machines, tax for entry and parking of motor vehicles in the historic city center, tax on nuclear device and tax on motor vehicles. Local taxes in Slovakia are therefore maintained by the municipalities, except from the tax on motor vehicles, which is the responsibility of Higher Territorial Units. (Act no. 582/2004 on local taxes and fees for municipal waste and minor construction waste)

In Slovakia since 1995, activities in the field of compulsory social security have implemented the Social Insurance Office, Health Insurance Offices and the National Labor Office. After transformation of social security system on 1 January 2004 the selection of social insurance is carried out by Social Insurance Office and the selection of health insurance by Health Insurance Offices (there is currently 1 government Health Insurance Office and two private Health Insurance Offices). Health insurance pays the employee in the amount of 4% and the employer 10% of the assessment base. Contributions to social insurance (for sickness insurance, pension insurance and unemployment allowance) paid by the employee is amount of 9.4% of assessment base and by employer 25.2 % of assessment base. In the area of pension insurance after the pension system reform were established in addition to the so-called Ist Pillar also the IInd and IIIrd Pillar of pension insurance. Ist Pillar is called as State pension insurance, IInd Pillar means that an employee can save part of the private pension insurance on account held by the pension management company. Since 2005, payments applied to Ist and IInd Pillar were in ratio of 9% and 9%. From 1 September 2012 the ratio of payments changed to 14% and 4%. The IIIrd Pillar presents voluntary options for additional pension security. (Act no. 461/2003 about Social Insurance, Act no. 580/2004 about Health insurance)

Hungary – structure and development of tax revenues



Source: Processed according to Eurostat

Figure 2 - Development of tax revenues in Hungary by species taxes as % of GDP

Hungary is a multiparty republic with a unicameral Parliament. The head of state is the President. Hungary is from territorial and administrative point of view divided into the capital city and 19 counties, 175 districts, 3152 villages and towns. (A magyar államról) Hungary joined the EU on 1 May 2004.

Hungarian tax system is based on direct income taxation, mutually payment of social insurance, property taxes and indirect taxes.

Hungarian tax system differentiates many kinds of taxes. It is hard to say their exact number, because one Act provides more kinds of taxes, respectively, even within the same type of tax may be different methods of taxation. Different types of taxes can be divided, for example, according to the number of fiscal accounts specified by NAV (National Authority for Taxes and Duties - Nemzetiadó- and vámhivatal). On these accounts, it is necessary to pay the taxes.

The NAV processed to 1 January 2014 together 73 tax accounts and 34 customs accounts. There are still not included local taxes, which are now 6 and they are paid to local governments. One and the same account at NAV have another 3 kinds of taxes on property acquisition. (NAV 2014 Act no. CXXII/2010 about NAV; Act no. XIX/2004 about Tariff and Financial Administration; http://nav.gov.hu/data/cms280521/Szamlaszamok_20130701.pdf).

Of course, the level of taxation is not only represented by number of taxes, but mostly by the high of tax burden. According to the impact on taxpayers in Hungary are taxes divided into direct and indirect. In Figure 2 we can see the development of taxes by type from 2000 to 2012.

In 2010 and 2011 the rates of direct taxation in Hungary were substantially reduced. From 2000 to 2010 personal income tax rate was progressive, there was one 18% and one 36% rate. This taxation system was from 2002 supplemented by relief called "nontaxable incomes of employees" about the level of minimum wage. Tax zone was usually increased every year in line with increasing inflation. Since 2010 was personal income taxation changed to linear taxation. For fiscal reasons, it has been a multi-step process between 2010 and 2013. In 2010 increased the tax base by 27% insurance on social security, but the tax rate was reduced to 17% respectively. 32%. Tax zone has increased significantly, with result that by higher tax rate were taxed only the top two-tenths of revenues. In 2011, the top tax rate was abolished and the tax rate on personal income tax was reduced to 16%. However, tax continued to be calculated from so-called super-tax basis and therefore the actual tax burden was at 20%. Since 2012, the tax allowance has been abolished and the determination of tax based on super-tax base counted only above a certain level of income. Calculation of taxes on super-tax base in 2013 was finally discharged from the system.

Corporate tax rate was linear up to 2010. First, the linear tax rate was 18% and in 2009 it increased to 19%. Since 2010, the tax rate by tax base up to 500 million HUF was 10%, and above this amount remained 19%. The corporate tax base can be reduced by many concessions; therefore the actual corporate tax burden is around 10%.

In the Hungarian state budget have the greatest weight indirect taxes (value added tax and excise taxes). The weight of indirect taxes continues to grow in last four years in parallel with reduction of tax rates on income of individuals and corporates. But the redistributive role of the state has not fallen, therefore the government is trying (to declining revenue from income taxes) to increase the number of indirect taxes and their rates.

The most important tax between indirect taxes is value added tax (VAT). Standard VAT rate from 2000 to 2005 was 25%, in the period from 2006 to 2008 it decreased to 20%, from 1 July 2009 increased it again to 25% and in 2012 the level rise again to 27%. This rate of VAT is now in the European Union the highest. In parallel increases also the reduced rate of VAT. In 2009, the rate was 5%, then the bulk of the products fall under new 18% rate, and the range of products taxed at reduced rate of 5% is significantly narrowed. (Act no. CXXVII of 2007 on Value Added Tax)

Excise taxes in Hungary tax the sale of alcohol, tobacco and mineral oil products, in accordance with the general regulations of the European Union. (Act no. CXXVII of 2003 on Excise taxes)

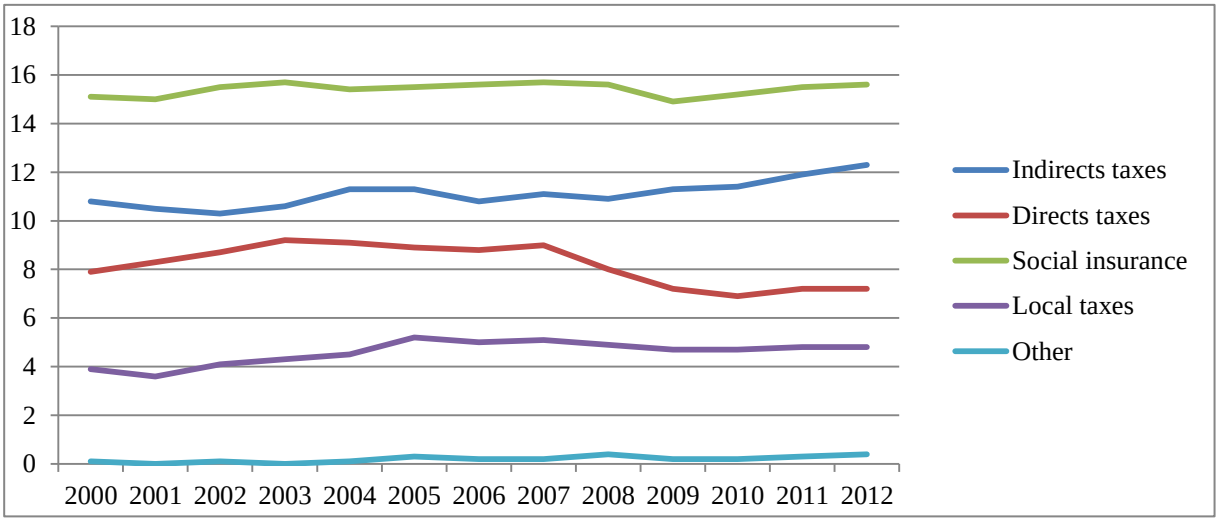
The high of social security contributions during the reporting period remained largely unchanged. In 2009 changed the rate of contributions paid by employer from 29% to 27%. Social insurance contributions were renamed in 2012 to social security tax. This is important because there is no claim to the payment of social security benefits yet. In 2010 finished the option of paying contributions to private pension funds, which operated from 1998. From this date, you can pay obligatory pension insurance exclusively to the state. The rate of pension insurance since 2011 has increased from 9.5% to 10%. The rate of health insurance in 2012 increased from 6% to 7%. Rate of unemployment insurance at 1.5% remained unchanged. (Act no. LXXX of 1997 on Social Insurance Act no. LXVI of 1998 on Health Insurance)

In the Hungarian tax system have been since 2006 also "Crisis taxes". At that time domestic financial institutions were burdened by "bank tax", simultaneously burdened were the individuals and

businesses with higher incomes by additional tax of 4% under the name "solidarity tax". Since 2010, there have been several sector taxes that were originally introduced only for three years, but later they became permanent. Such as special tax on financial institutions, telecommunications tax, energy tax, tax on unhealthy goods, transaction tax, insurance tax, tax on public services, and tax on income of energy supplier. These taxes currently provide to the state budget revenues about 5% of GDP. (Act no. 2012/CCIV about Central budget; Act no. XCIV 2010Emergency tax in certain sectors; Act no. LVI of 2012 Tax on telecommunications; Act no. CXVI of 2012 Tax on financial transactions)

Czech Republic – structure and development of tax revenues

Legislative power in Czech Republic is a bicameral parliament - Deputies and Senate. The head of state is the President. The land is divided into 14 regions, 77 districts, 6,249 towns and villages. (Národní ústav odborného vzdělávaní) Czech Republic joined the European Union on 1 May 2004.



Source: Processed according to Eurostat

Figure 3 - Development of tax revenues in Czech Republic by species taxes as % of GDP

Czech tax system is in its main features similar to systems of most developed European countries. The tax system currently consists of thirteen taxes: personal income tax, corporate tax, property tax, road tax, inheritance tax, gift tax, real estate transfer tax, value added tax, tax on mineral oils, beer, wine, spirits and tobacco products. Other levies of fiscal nature are social security contributions, health insurance and local taxes.

Tax revenues come from direct and indirect taxes. By the tax on personal income occurred since 2001 in the Czech Republic several changes in tax rates. Between 2001 and 2005, the rates were progressively moving in four tax zones of 15%, 20%, 25% and 32%. Between 2006 and 2007, still dominated progressive rate of taxation, four tax zones remained, but the rates were changed to 12%, 19%, 25% and 32%. Since 1 January 2008 tax reform took place; it brought a whole new calculation of income tax. Personal income tax rate became linear uniform rate set at 15%. Since 2014 has been cancelled the joint taxation of spouses, which was first introduced to the Czech tax system in 2005. The annual amount of tax allowance for taxpayer moved in analyzed period from 34,920 CZK to 24,840 CZK. The amount of 24,840 CZK is still true at present. Since 2013 has been introduced solidarity tax paid by taxpayer with monthly income over 103,536 CZK (plus 7% to standard rate). (Act no. 586/1992 Income Taxes Act, Revised)

Corporate tax rate declined over the years in Czech Republic. The rate from 2000 to 2004 was 31%, in 2005 - 26%, in 2006 and 2007 - 24% and in 2008 - 21%. Since 2009 was the tax rate of 20%, and since 2010 it has been 19%, excluding investment funds, pension funds and mutual funds, for which the rate is 5%. Any dividend incomes, profit shares, liquidation shares have separate the tax base and the rate is 15%. In the OECD belongs the rate to the lowest. (Act no. 586/1992 Income Taxes Act, Revised)

In the area of property taxes from 2013 has been introduced a linear rate of 20% for gift tax and 10% for inheritance tax. Since 2014 is inheritance tax abolished, inheritance is therefore exempt. Gift tax fall under income tax and it is paid according to the rate of 15% for individuals and 19% for companies. Donations are therefore taxed in the income tax return. (Act no. 357/1992 on Inheritance tax, Gift tax and Real Estate Transfer, Act no. 338/1992 on Real Estate Tax)

Joining the European Union, Czech Republic was forced to implement in its legislation the new legislation on indirect taxes. The result was an increase in revenues from indirect taxes due to an increase in excise tax rates and reducing of items taxed by reduced VAT rate.

The basic tax rate of VAT in Czech Republic in April 2004 was at 22%. From the date of joining the European Union in 2004, the basic VAT rate was set at 19%. In the period 2010 – 2012 was it 20%. Reduced VAT rate was in 2008 at 5%, and since then it increases regularly. In 2008 and 2009, it increased to 9%, in 2010 to 10% and in 2012 in to 14%. Taxed by reduced rate are for example food, medicine, books, magazines, newspapers, regular mass passenger transport, funeral services, water and sewerage, heat supply, cultural activities, accommodation, works related to housing. From 2013 reduced VAT rate has increased from 14% to 15% and standard VAT rate from 20% to 21%. (Act no. 235/2004 on Value Added Tax, Revised)

Act on Excise Taxes was in 2004 amended many times because of legal legislation convergence with the legal regime in the EU Member States. Since 2004, excise taxes administration has been transferred to the Customs Authorities. Subject of excise taxes in Czech Republic are: mineral oil, spirits, beer, wine and tobacco products. Tax rates are fixed. (Act no. 353/2003 on Excise taxes)

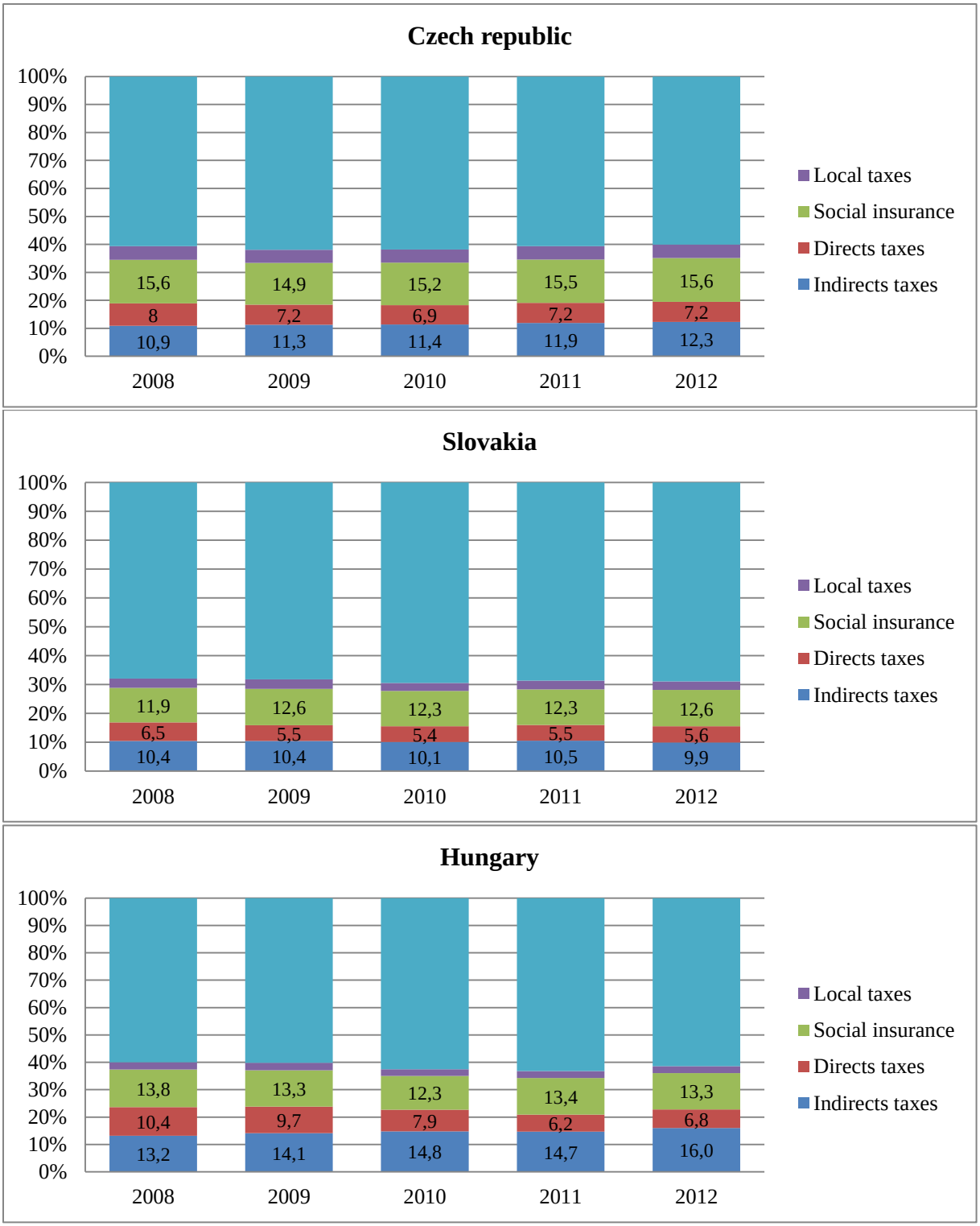
The rate of health insurance in the analyzed period remained unchanged; employee pays contributions of 4.5% and employer of 9%, a total of 13.5%. Employees' social security contribution was from 2000 to 2008 in amount of 8%; from 2009 it is at 6.5%. Employers' social security is 25%, therefore a total of 31.5%. Since 1 January 2013 was introduced a new voluntary second pillar pension system (pension savings of 3.5%). (Act no. 48/1997. on Public Health Insurance, Act no. 470/2011 on Sickness Insurance, Act no. 155/1995on Pension Insurance)

Table 1 – Tax rates in analyzed countries in 2014 in %

Taxes		Slovakia	Hungary	Czech Republic
Income tax	personal	19 a 25	16	15
	corporate	23	10 a 19	19
VAT	standard rate	20	27	15
	reduced rate	10	5 a 18	21
Social and Health Insurance	employee	13.4	18.5	11
	employer	35.2	28.5	34

Source: Acts of countries

Following figure shows the proportion of each taxes types in analyzed countries as a percentage of GDP.



Source: Processed according to Eurostat

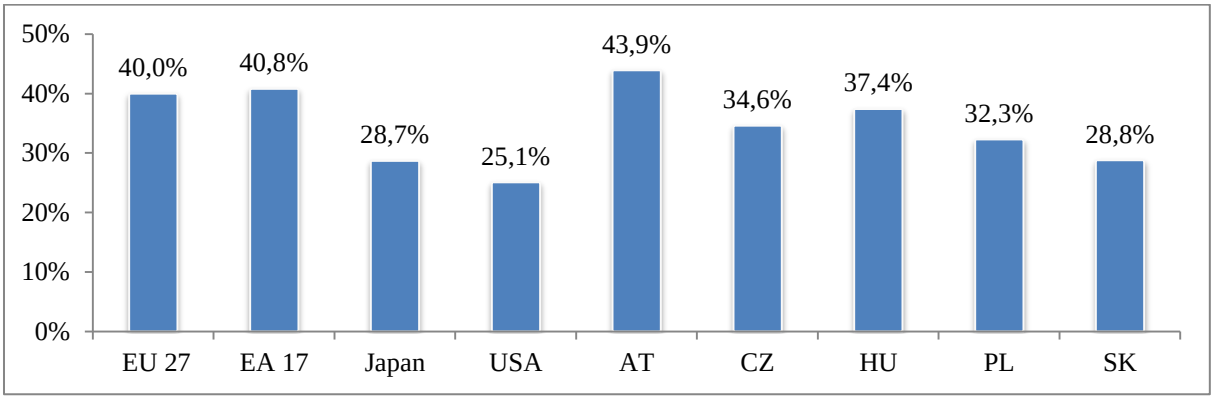
Figure 4 – Collected taxes from 2008 to 2012 in % of GDP

3. Tax burden in the European Union and direct tax harmonization due cluster analysis

Following the tax burden of countries we generally use two types of indicators, tax quota and effective tax rates. Tax quota indicator belongs to most common indicators measuring the tax burden, which shows the extent of financial resources outflow from the revenue of taxpayer. It is followed generally for one year.

Tax quota is determined as a proportion of total tax revenues (sum of all public budgets tax revenues) and gross domestic product. For partial comparison of tax burden it is calculated with

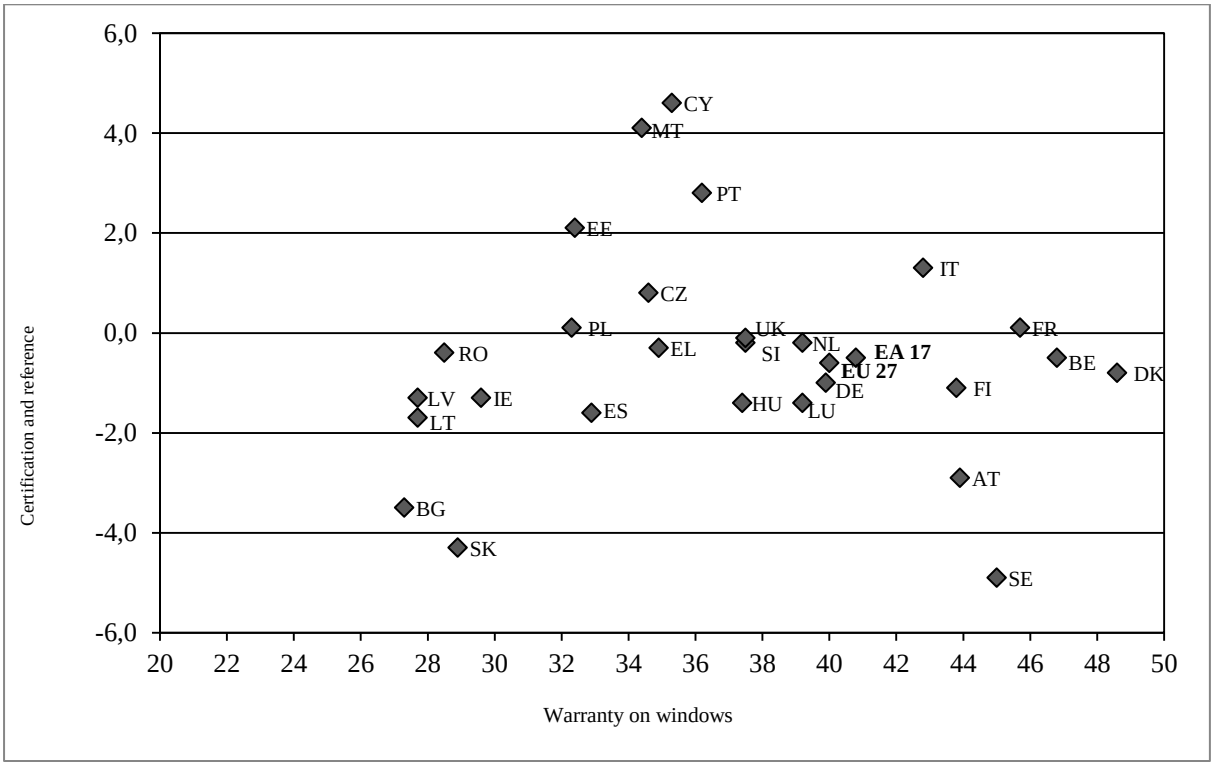
different groups of taxes. The most frequently used groups are group 1000 (Taxes on income, profits and capital gains) divided into 1100 (Taxes on income, profits and capital gains of individuals) and 1200 (Corporate taxes on income, profits and capital gains), group 2000 (Social security contributions) and group 5000 (Taxes on goods and services).



Source: Eurostat (for the EU and Member Countries), OECD (for Japan and USA)

Figure 5 - Total revenues from taxes and social contributions in % of GDP in 2011 (Tax quota)

According to the European Commission report (2013) is European Union the zone of high taxes. As the Figure 5 shows tax quota in the EU has been the highest in comparison with three world most advanced industrial centers. It represents 39.3% of average weighted GDP, which is one-third more than the results achieved in the US and Japan.



Source: Processed according to Eurostat

Figure 6 - Total receipts from taxes and social contributions in % of GDP – base year 2011[8]

[8] **EA 17 – Euro (€) area** (BE, DE, IE, EE, EL, ES, FR, IT, CY, LU, MT, NL, AT, PT, SI, SK, FI)
EU-27 – European Union (BE, BG, CZ, DK, DE, EE, IE, EL, ES, FR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, PT, RO, SI, SK, FI, SE, UK)

The change of tax quota in EU countries between years 2001 and 2011 shows Figure 6. In the upper half (above the zero axis) are those countries where the tax quota from 2001-2011 increased and negative values (below the zero axis) represent a reduction of tax burden in the country. The x-axis shows the amount of tax quota in 2011. Sweden and Slovakia cut the tax burden significantly since 2001. Two of countries, Malta and Cyprus increased their overall tax ratio markedly.

Harmonization of direct taxes in comparison with the indirect is rather the consideration than implementation. The reason is that the issue of direct taxation is an area in which European legislation adopted unanimously by the Member States and would like to keep the specifics. Harmonization of direct taxation is possible only in case their negative impact on the functioning of the EU internal market. So we decided in cluster analysis to focus only on direct taxes.

Cluster analysis

Input data are data obtained from statistical reports, which are published annually on the Internet (Taxation trends in the European Union) and in Eurostat databases. Research method is cluster analysis, used is one of the clustering methods - hierarchical clustering. The analysis was conducted in statistical program R 2.15.2. Through the award of orders were generated tree graphs so. Dendrograms. The input data are the amounts of direct taxes (PIT – personal income tax, CIT – corporate income tax). The objective of cluster analysis is to achieve such groups of EU member states, which would be characterized by certain homogeneity.

Cluster analysis sorted data into groups with the greatest possible similarity within the group and the largest difference between groups.

The basic methods of clustering we used were:

- *Hierarchical methods* are based on sequentially joining of clusters, their number decreases continuously until finally all clusters are combined into one. This method is graphically displayed as tree diagram respectively cluster dendrogram.
- *Wards method* involves an agglomerative clustering algorithm. It looks for groups of leaves that it forms into branches, the branches into limbs and eventually into the trunk. Ward's method starts out with *n* clusters of size 1 and continues until all the observations are included into one cluster. (The Pennsylvania State University)

Tree clustering starts by calculating the distance between objects, which is called the Euclidean distance and is defined by the formula:

$$d_{ij} = \sqrt{\sum_{k=1}^{K} (x_{ik} - x_{jk})^2} \qquad \text{Eq. (3.1)}$$

Where x_{ik} is the value of „k“ variable for i-th object and x_{jk} is the value of „k“ variable for *j-th* object. For the calculated distance is than determined the rule of linking statistical units into clusters. There are six rules of linking:

- Single – Linkage (Nearest Neighbor)
- Complete – Linkage (Furthest Neighbor)
- Unweight Pair – Group Average (Group Average)
- Weighted Pair – Group Average (Simple Average)
- Unweight Pair – Group Centroid (Centroid)
- Weighted Pair – Group (Median)

Cluster analysis was performed in R 2.15.2 using various packages. For analysis were installed packages *class, cluster, LLAhclust, mclust, pvclust*, and *stats*. Input data were the values of personal income tax (PIT) and corporate income tax (CIT). The data are presented in following Table 2:

Table 2 - The most important direct taxes in the EU-27

Country	PIT (in % of GDP)	CIT (in % of GDP)
Belgium (BE)	12,3	2,7
Bulgaria (BG)	2,9	1,9
Czech rep. (CZ)	3,6	3,4
Denmark (DK)	24,3	2,7
Germany (DE)	8,4	2,2
Estland (EE)	5,4	1,4
Ireland (IE)	7,6	2,6
Greece (EL)	4,3	2,4
Spain (ES)	7,4	1,8
France (FR)	7,6	1,9
Italy (IT)	11,7	2,3
Cyprus (CY)	4,2	6,2
Latvia (LV)	6,2	1
Lithuania (LT)	3,6	1
Luxemburg (LU)	7,9	5,7
Hungary (HU)	6,5	1,2
Malta (MT)	6	6,5
Netherlands (NL)	8,5	2,3
Austria (AT)	9,7	2
Poland (PL)	4,5	2
Portugal (PT)	5,6	2,8
Romania (RO)	3,3	2,3
Slovenia (SI)	5,7	1,9
Slovakia (SK)	2,3	2,5
Finland (FI)	12,5	2,5
Sweden (SE)	15,7	3,4
United Kingdom (UK)	10,1	3,1

Source: Eurostat Statistical Books, 2013

There are „*p*“ objects in the analyzed group, namely 27 EU countries in which are pursued „*k*“ quantitative characters (2 variables), the distance d_{ij} between *i-th* element and *j-th* element is Euclidean distance. The steps of cluster analysis in R 2.15.2 were following:

> data=read.csv2("pit.cit.gdp.csv") – uploading data
>country=data$Country
> row.names(data)=country – assignment of countries names

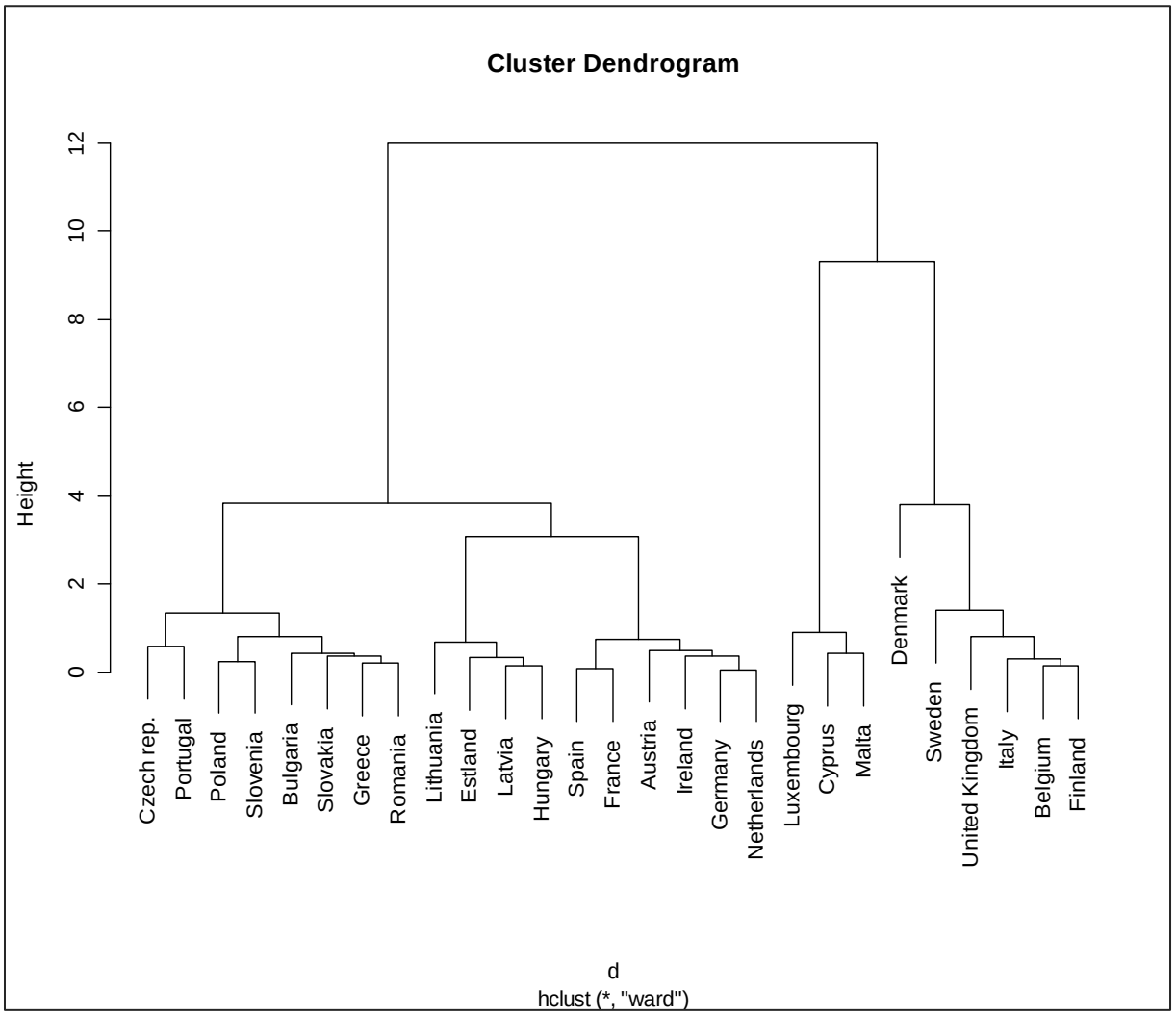
If the file is missing values of variables in some countries, it is necessary to remove them from the dataset. If the variables are in different units, it is necessary to implement scaling, which means unit conversion to a comparable level:

> p<-subset(data, select=c(PIT,CIT))
> data<-p
> data <- na.omit(data)
> data<-scale(data)

Clustering was realized by following commands:

> d<-dist(data,method="euclidean")
> fit<-hclust(d, method="ward")
> plot(fit)

The result of clustering is a tree graph - dendrogram (from Greek *dendron* = tree, and *gramma* = drawing). Dendrogram is a type of diagram that is used to illustrate steps of cluster analysis. Each element expressed separate on the vertical axis. Clusters unite according to the shortest distance. At the end all objects are joined into one cluster. Dendrogram shows the course of the analysis and results can be detected in both directions - forward and backward.

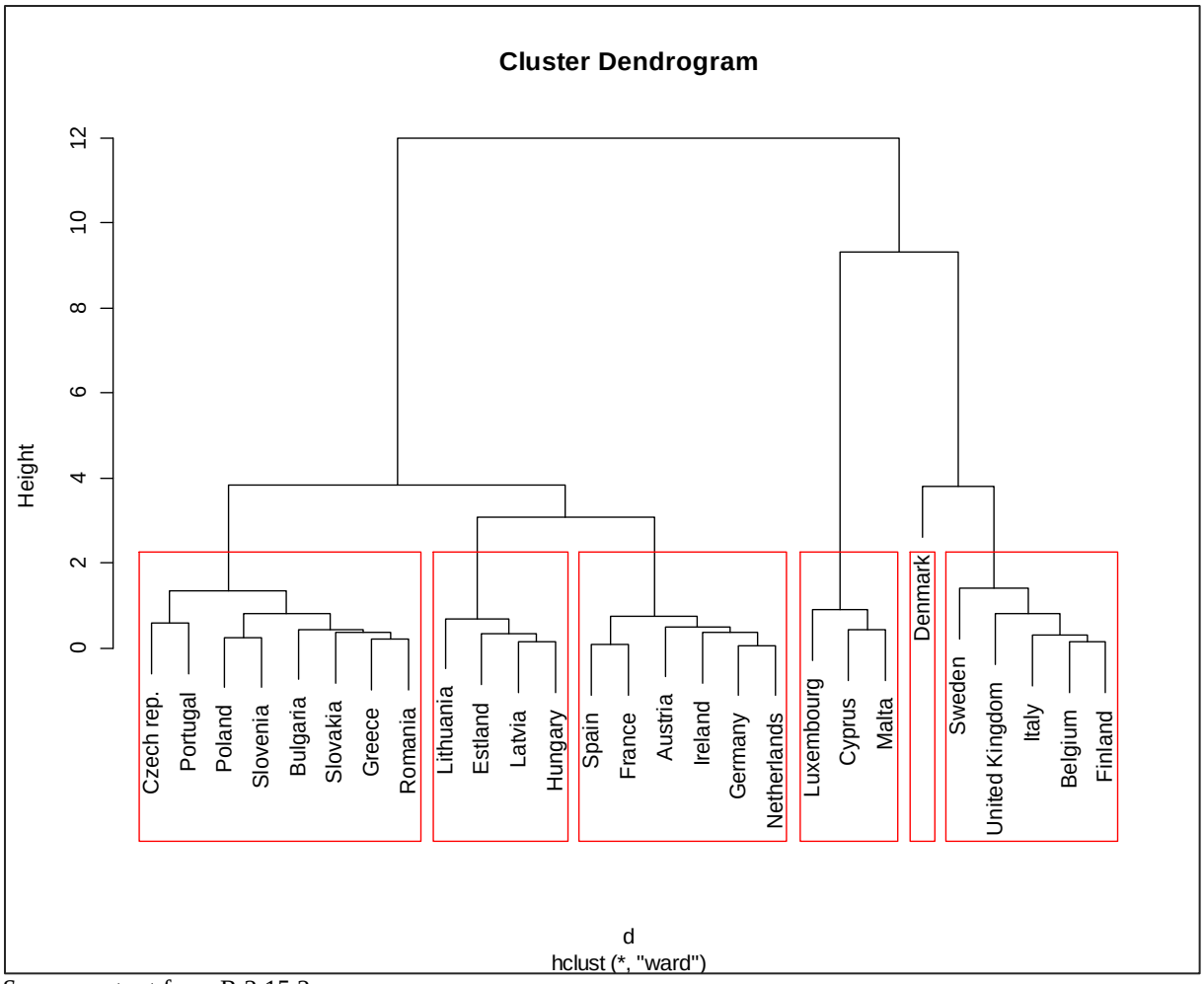


Source: output from R 2.15.2

Figure 7 - Cluster dendrogram according to Wards method (PIT, CIT in % of GDP)

In the dendrogram can be identified six similar groups of countries with similar characteristics (PIT, CIT in percentage of GDP). These groups are highlighted in color through the following commands:

```
> groups <- cutree(fit, k=6)
> rect.hclust(fit, k=6, border="red")
```



Source: output from R 2.15.2

Figure 8 - Cluster dendrogram according to Wards method - highlighted clusters (taxes in % of GDP)

The same procedure was used by taxes expressed as a percentage of total taxes. The data are shown in Table 3.

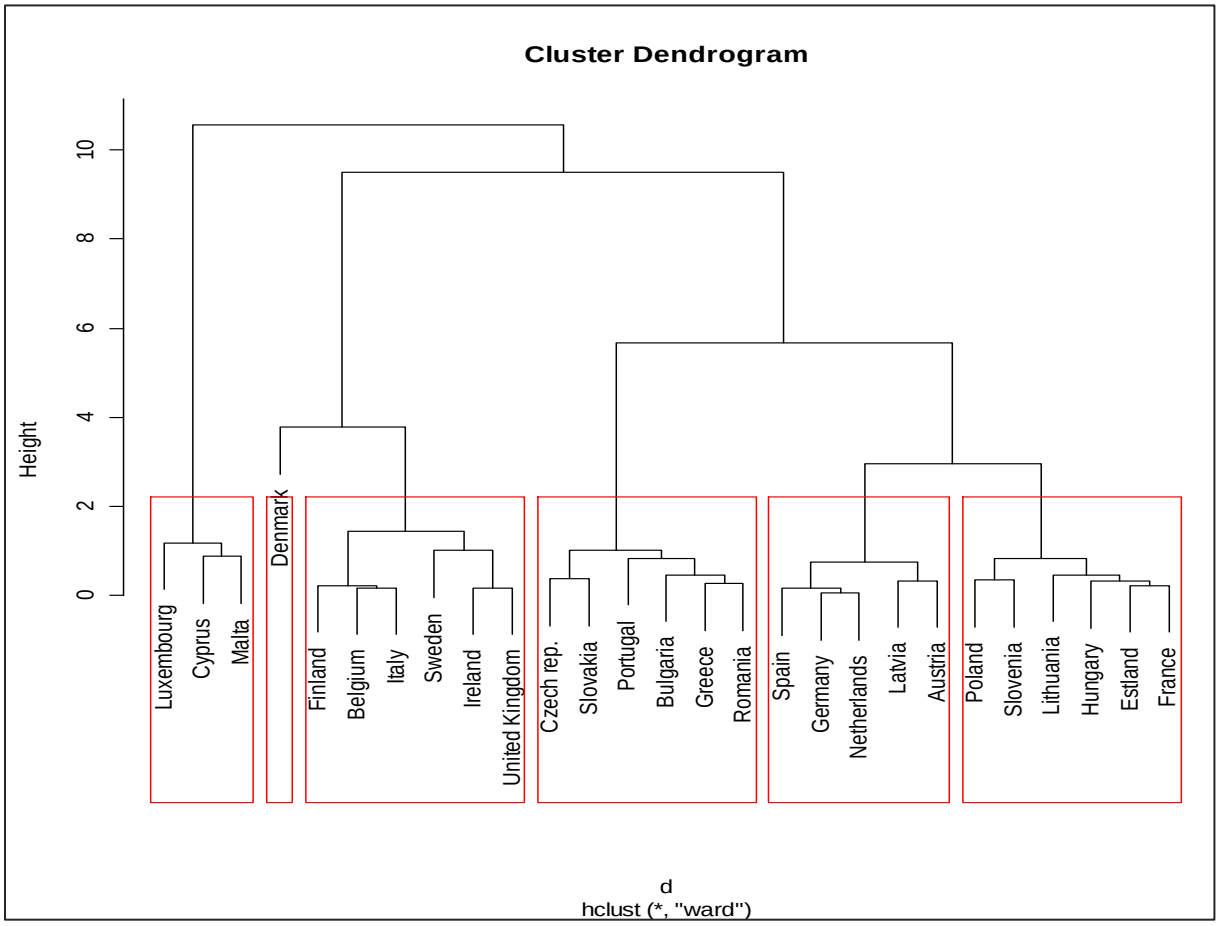
Table 3 - The most important direct taxes in the EU-27

Country	PIT (in % of Total taxes)	CIT (in % of Total taxes)
Belgium (BE)	28,1	6,2
Bulgaria (BG)	10,5	7
Czech rep. (CZ)	10,6	10
Denmark (DK)	51,1	5,8
Germany (DE)	22	5,8
Estland (EE)	15,9	4
Ireland (IE)	27	9,1
Greece (EL)	14	7,7
Spain (ES)	23,1	5,8
France (FR)	17,8	4,4
Italy (IT)	27,7	5,5
Cyprus (CY)	11,6	17,4
Latvia (LV)	22,5	3,5
Lithuania (LT)	13,5	3,7

Country	PIT (in % of Total taxes)	CIT (in % of Total taxes)
Luxemburg (LU)	21,2	15,5
Hungary (HU)	17,2	3,1
Malta (MT)	17,9	19,6
Netherlands (NL)	21,8	6
Austria (AT)	23,2	4,8
Poland (PL)	14	6,3
Portugal (PT)	17,7	9
Romania (RO)	12,3	8,5
Slovenia (SI)	15,1	5
Slovakia (SK)	8,2	8,9
Finland (FI)	29,7	6
Sweden (SE)	34,2	7,5
United Kingdom (UK)	28,3	8,7

Source: Eurostat Statistical Books, 2013

In the next dendrogram also can be identified six similar groups of countries with similar characteristics (PIT, CIT in percentage of Total taxes).



Source: output from R 2.15.2. Based on results of cluster analysis in both cases were formed six clusters, suggesting that the values of personal income taxes and corporate taxes are among the Member countries significantly different.

Figure 9 - Cluster dendrogram according to Wards method - highlighted clusters (taxes in % of Total taxes)

Conclusion

Due to the growing debt crisis in euro area harmonization of direct taxation becomes subject of much debate. Major European politicians and experts are calling for greater integration in the EU, because it is a kind of prevention against future economic problems. Harmonization of direct taxes would probably mean a gradual process of convergence of national laws. But this is not a cure for the current economic problems. There is already some cooperation in the field of direct taxation between Germany and France. The question is whether harmonization is concerned only Eurozone countries or all 28 Member States.

Harmonization of direct taxes has many flat-rate benefits, but also individual economic consequences for some countries. States with low tax burden would lose one of their comparative advantages to increase the attractiveness of business environment. The advantage of direct tax harmonization is particularly the removal of legal and administrative barriers in international investment flows, which would result in increased competition in the economy and would increase living standards of EU citizens.

In the field of direct taxation, the European Commission's activities focus mainly on corporate income tax. Considering four possible harmonization models:

- *HST (Home State Taxation)* – businesses would use for pan-European activities rules that are valid under the tax system of the country where the parent company has its registered office or place of management. The system would be voluntary for Member states and also for groups of companies.
- *HETS (Harmonized European Tax System)* – corporate income tax would be fully harmonized except tax rates.
- *EUCIT (European Union Company Income Tax)* – this system would introduce a common consolidated tax base only for large multinational companies. European corporate income tax rate should be uniform and managed by the European Community.
- *CCCTB (Common Consolidated Tax Base)* – system would be voluntary for member states and corporations. The countries involved in this system would agree with the definition of taxable income, the definition of the consolidated group, cross-border losses and the formula for the proportionate distribution of profits.

According to the results of cluster analysis, it is possible, in theory, to outline the procedure in the field of direct taxes harmonization. The process would not run in all countries at the same time, but in groups of the Member States whose tax systems are highly similar.

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EMPLOYEE ABSENTEEISM -AN EXPLORATORY FACTOR ANALYSIS

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Abstract:

Employees absent themselves from work due to a variety of factors which include personal, family and health problems, social and family obligations and work related issues like stress, relationship with co-workers and the superiors. Another important reason for absence is the sheer entitlement for leave as per organizational policy. Absenteeism, whether scheduled or unscheduled, causes productivity loss and hurts the general morale of the work place, resulting in the increase of operating expenses. It may be difficult to straight away find a cure for solving the issue of absenteeism, but the key is in identifying the nature and relationship that exists among the various factors causing absenteeism and to take a holistic approach to the problem. This article analyses the factors affecting absenteeism based on a survey conducted with the help of a structured questionnaire containing 13 variables related to the absenteeism of the employee. Data relating to 198 employees working in a manufacturing plant in Chennai, India was analyzed. A theoretical exploratory factor analysis model was built using the three factors identified by the Factor Analysis. Based on the feedback revealed by the modification indices, a revised model has been designed and tested for model fit.

Key words: absenteeism model, SEM, exploratory factor analysis.

JEL Classification: M12

1. Introduction

Absenteeism has been researched extensively received (Harrison and Martocchio, 1998). Absenteeism occurs when an employee does not report for work, with advance information or not. An employee absents for various reasons. The reasons for the absence can be deliberate or not at the control of the employee. Huczynski & Fitzpatrick (1989) found that genuine sickness was the major reasons for absence. The employee may take leave from the work place due to job dissatisfaction, chronic medical problems, vacation, temporary illness, personal issues or responsibilities, poor work environment, non-motivated co-workers, job dissatisfaction, job stress, difficulties in transportation, lack of commitment to the organization, financial worries, responsibilities related to children, accidents, adverse weather conditions, festival holidays, national and public holidays, eligible leave as per leave policy etc. Hayday (1998) stated that the reasons for absenteeism could be grouped under, attitude and stress, health and lifestyle, work place and domestic factors. Jinhee Kim and E. Thomas Garman (2003) estimated that the single most important reason for absence was sickness, but the other reasons accounted for about 67%. Leave entitlement mentality accounted for 10% out of the reasons other than health. This article analyses the major factors causing employee absenteeism, giving more emphasize to the fact that the workers are tempted to be absent just because of their leave entitlement and, the nature of the relationship among the factors causing absenteeism. Many questions have been included in the questionnaire on leave policy and leave entitlement to ascertain their importance. Brooke and Price (1989) included health and organizational constructs related factors in their causal model. The present study attempts an exploratory factor analysis model for the reasons of absenteeism and the relationship among them using structural equation modeling method. Many models are found in the literature on absenteeism. Steers and Rhodes model (1978) has been one of the important models cited in the previous literature on absenteeism. Absenteeism causes the firm to incur additional costs which would ultimately affect the financial performance of the company. Absence causes overtime to the other employees, under-utilization of the plant capacity, productivity losses, dissatisfied customers and loss of business and bad employee morale. To illustrate how changing life style can cause absenteeism from the work place, we can cite that due to improvements in technology, commuting to the work place using two wheelers and four wheelers has become the norm. As a result

there is congestion in traffic during peak office hours. Added to this, in most of the cities, children also have to commute to their schools and colleges during the same peak hours. In developing countries like India, children are dropped at schools by their parents. This domestic responsibility adds to the delay of the workers to their work place. Also, due to economic growth and urbanization, the majority of city dwellers are those who have migrated from their native villages. These workers visit their villages regularly during month ends and for festivals. The workers absent themselves from their work places during month ends and festival times in most of the cases. The management has to consider the absence of employees as a serious issue and take suitable remedial steps. The reasons for the absence of an employee, as seen above, can arise because of the problems originating from the employee or from the organization. The organization shall strive to provide a right work environment so that it is not responsible for the employee absenteeism. At the same time, the organization shall understand and analyze the reasons originating from the employees for the absence of the employees, understand the nature of the factors causing such absence and design a suitable policy to manage the employee absenteeism. As stated above, the present study attempts an exploratory factor analysis model for absenteeism using structural equation modeling method and for this purpose SPSS AMOS has been employed.

2. Review of Literature

The Industry Absenteeism report revealed that the absent was about 10 percent of workdays (Harrison and Martocchio 1998) and the cost of it had been approximated as $40 billion per year. (Gaudine and Saks, 2001). Biron and Peter Bamberger (2012) in their paper could not arrive at consistent conclusions on the relationship between an unfriendly workplace and absenteeism which showed the relevance of other factors in this association. Andres Pousette and Jan Johansson Hanse (2002) studied the test for models having different job characteristics, psychological variables, health issues and absence due to sickness. Nicholson (1977) in his model, assumed that involvement and commitment to work, personal traits, miscellaneous factors like vehicle repairs, job motivation do influence the absence of employees. It is common practice that employees take sick leave when in fact there are no health reasons. The reasons for absence could arise because of personal illness, family issues and personal requirements (Harris Interactive, CCH Unscheduled Absence Survey, 2002). Also the Survey stated that the employees missed work due to stress (12%), family issues (24%), sheer entitlement (10%) and personal needs (21%). Elizabeth Keenan and Sheri Farahani (2003), classified absences of the employees into two types, namely, culpable and innocent. Michal Biron and Peter Bamberger (2012) stated that other contextual factors were important in the relationship between absence and aversive workplace conditions. Vistnes (1997) and Dione and Dostie (200) have found that demographic variables like sex and age of the employees also are the reasons for absenteeism. European Foundation for the Improvement of Living and Working Conditions in its European Research Report (199) stated that the process of absenteeism control was influenced by company factors, work place factors, individual factors, and societal factors. Søren Jensen and James McIntosh (2007) cited that several econometric models of employees' absence were based on utility maximizing models where the employees weigh the costs and benefits arising out of their decision to attend or not to attend for work. Zach, Florian J., (2010) used modeling in the context of establishing the relationship among the various organizational units and partners of the organization.

3. Methodology

A survey was undertaken during March, 2013 among the employees of a manufacturing organization in Chennai using a structured 5 point Likert Scale questionnaire containing 13 variables asking the employees for the reasons of their absenteeism. The 13 variables included in the questionnaire are, 1. I am satisfied with the leave rules and regulations 2. Disciplinary action is taken by the management against absenteeism 3.The cause of absenteeism is due to regular health problems 4.The cause of absenteeism is smoking or drugs or any other chewing habits 5.The involvement in personal business is a cause for absenteeism 6. I am satisfied with the number of paid leave allowed to me 7.I take leave because I am asked to work additional hours 8. I am satisfied with public holidays allowed 9. I am satisfied with sick leave given by my company 10. I get leave for religious functions 11. I get leave for local festivals 12. I exhaust my eligible leave every year and 13. I am aware of the leave policy of the company. The five point scale indicated the preferences of the respondents as, 5-

Strongly agree, 4- Agree, 3-Neutral, 2-Dis-Agree and 1-Strongly Dis-agree. Valid data was collected from 250 employees selected on the basis of random sampling method. 87 per cent of the employees that is, 198 employees belonged to the age group of 41 years to 50 years. The collected data relating to these employees belonging to the age group of 41 to 50 years was analyzed using Factor Analysis to identify the factors causing absence among the employees of the organization. A theoretical exploratory model (Appendix 1) was designed consisting of the factors thus identified. The model was tested for the goodness of fit through structural equation modeling using Amos software. The initial model was improved for robustness and a final model is arrived at (Appendix 2) showing the inter-connected nature of the factors causing absenteeism among the employees.

4. Data analysis and findings

Data consisting of 13 variables were subjected to Factor Analysis. Three variables namely, (1) The cause of absenteeism is smoking or drugs or any other chewing habits (2) I am satisfied with sick leave given by my company and (3) I am aware of the leave policy of the company did not load clearly into any one the factors and hence excluded from further analysis. The Factor Analysis revealed sampling adequacy with KMO measurement of sampling adequacy of 0.771.

Table 1-Factor analysis

Factor 1	**Factor 2**	**Factor 3**
1. I am satisfied with the leave rules and regulations 2. Disciplinary action is taken by the management against absenteeism. 3. The cause of absenteeism is due to regular health problems.	1. The involvement in personal business is a cause for absenteeism. 2. I am satisfied with the number of paid leave allowed to me 3. I take leave because I am asked to work additional hours 4. I am satisfied with public holidays allowed	1.I get leave for religious functions 2. I get leave for local festivals 3. I exhaust my eligible leave every year

The analysis resulted into three factors were named as HEALTH, PERSONAL and SOCIAL based on the latent underlying reasons behind the variables. An exploratory model as shown in Appendix I was tested with the help of Amos program by including these three factors as latent factors. The model fit was checked with the help of the model parameters, GFI, AGFI, CFI, RMSEA and Hoelters Critical N. These parameters require standards of '0.90 or more' for GFI and AGFI, '0.95 or more' for CFI, 'less than 0.05 but not more than 0.08' for RMSEA and '200 or more at 0.01 significance level' for Hoelters Critical N for a robust goodness-of-fit model. The exploratory model measured GFI=0.883, AGFI=0.799, CFI=0.919, RMSEA=0.130 and Hoelters Critical N=76 at 1% significance level and hence did not reflect the standards of fit required for a robust model. Hence, the Modification Indices were called for from the Amos software and checked for improving the model. It was observed that there was misspecification of error terms between 'I take leave because I am asked to work additional hours' and 'I am satisfied with public holidays allowed' and also between the error terms 'The cause of absenteeism is due to regular health problems' and 'The involvement in personal business is a cause for absenteeism'. According to Aish & Joreskog (1990), these measurement error co-variances are because of the systematic measurement error in item responses, which may be due to either the variables or the respondents. Yet another reason could be due to the overlap of the content of the variables. The misspecification of error terms bring out the cross relationships existing between the true intention of the employees for the absence. The analysis shows that the employees take leave when asked to work additional hours and this absence is compensated by the public holidays allowed.

It appears that the employees take leave to attend to their personal matters under the pretext of sick leave. Hence covariance relationship between these error terms were built into the model and tested again for the goodness-of-fit of the model. The revised model is given in Appendix II.

The revised model satisfied all the standards required for a robust model. The goodness-of-fit measures for the revised model are 0.959 for GFI and 0.925 for AGFI, 0.988 for CFI, 0.052 for RMSEA and 218 at 0.01 significance level for Hoelters Critical N. All the measurement variables loaded significantly into their latent variables and construct validity of the model has been verified. The top five significant variables explaining the absence are found to be 1. I get leave for local festivals 2. I am satisfied with the number of paid leave allowed to me 3. I exhaust my eligible leave every year 4. The involvement in personal business is a cause for absenteeism 5. I take leave because I am asked to work additional hours, as ranked by the standardized regression coefficients of 0.963, 0.958, 0.870, 0.833 and 0.830 respectively. Also the analysis revealed that the lowest score was given to the variable, 'I am satisfied with the leave rules and regulations'. These variables again may indicate the reasons for the absence which are mostly for the sake of entitlement.

Conclusion

A review of the factors show that the reasons for the employees absence can be broadly categorized into Health reasons, reasons related to Social necessities and reasons related to Personal and domestic requirements. The results of the study may be useful for identifying the factors which cause absenteeism and will complement researches on social, personal and health reasons that encroach on employee absenteeism, such as job satisfaction (Goldberg and Waldman, 2000), job involvement (Baba and Jamal, 2002), and job stress . It is observed that the common thread running through all these factors is the entitlement to leave from the organization, an organizational construct. Hence it can be inferred that the employees avail their leave keeping in mind their eligible holidays, without there being any necessity or need for the absence. The underlying rationale for the absence again is not any one of the factors taken alone but a combined one. The structural equation modeling shows that the three factors of absenteeism namely, Health, Personal and Social are inter-related. Employees take leave of absence under one pretext or the other, that is, for example, if they have exhausted their eligible sick leave, they would take casual leave etc. The management of the organization shall consider any absenteeism control measure appreciating the inter-related nature of the factors causing the absenteeism and not tackle the issue considering only one of the factors at a time. Most of the companies have executed wellness programmes and self interventions to lessen the health based absenteeism issues among employees. Training programmes to develop self-confidence and awareness of the business problems may help the employees to balance their social and personal needs at work place. Thus, the model depicts that to design a suitable absenteeism control scheme, the management shall take into consideration factors relating to the workplace, social setting of the employees, benefits offered by the organization related to the health and family benefits, statutory and other holidays allowed. Future research is warranted in the study of the role of organizational constructs, besides personal, social and health related reasons, in absenteeism.

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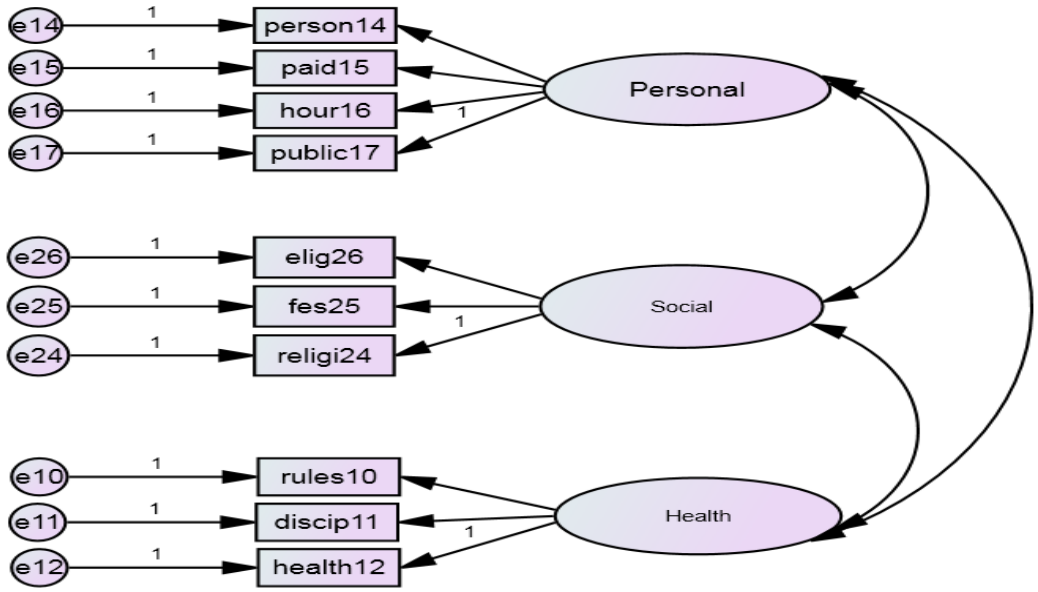
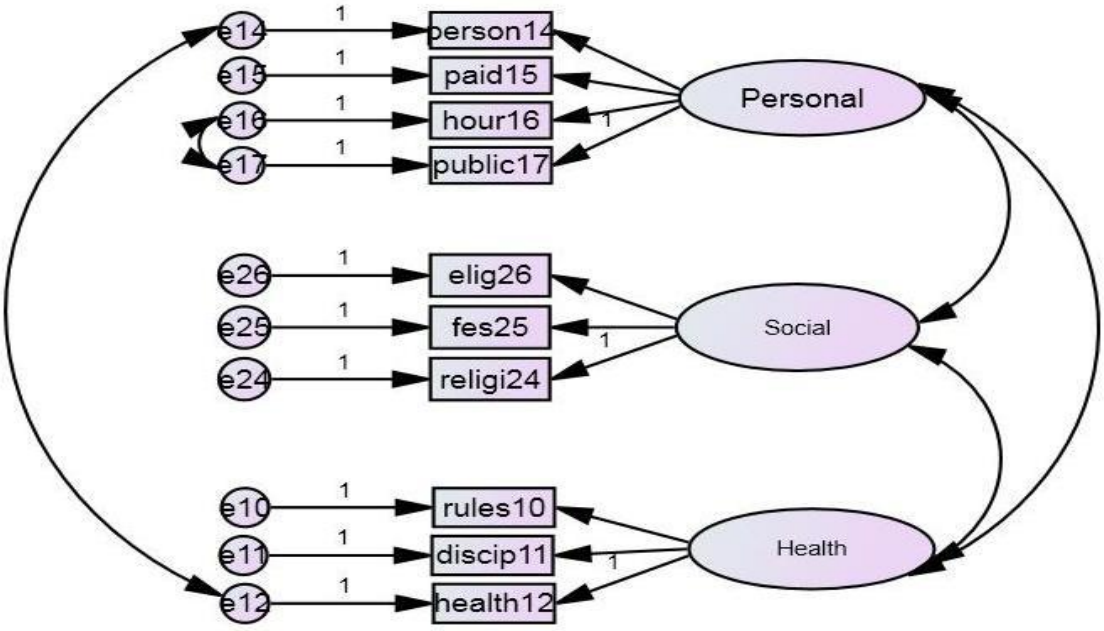
APPENDIX I

Absenteeism Exploratory Model



APPENDIX II

Absenteeism Revised Model



THE PROFESSIONAL PERFORMANCES ANALYSIS AND THE IMPROVEMENT MODALITIES OF THESE AT THE LEVEL OF THE FINANCIAL INSTITUTIONS

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Abstract:

The human resources management is the field which manages one of the most valuable organizational goods – the people. The theory and practice development in the field of human resources management, firstly supposes the knowledge and the understanding of role and human resources within an organization.

The performance management is a component of the human resources management and it is based on the theory when people know and understand what is expected from them and they are able to participate at the formulation of these expectations, they can and act to achieve them. The performance management requires the continuous improvement of the employees' activity, their professional performance growth, in order to achieve the organizational goals. The advantageous use of the performance management presupposes the existence of a system of performances assessment, of a system of the employees' boost and of a reward results system.

Keywords: management, human resources, assessment, professional performances, employees, financial institutions

JEL classification: M 54, M53

1. Introduction

In the work which is entitled The Analysis on professional performances and the improvement ways of these at the level of the financial institutions, we will try to capture the aspects concerning the human resources management and its importance within the organization, the issue of performance management as a component of the strategic management of the human resources, as well as the importance of the professional performance assessment of the staff, highlighting the characteristics, the main categories of evaluators and assessment methods, especially to the level of the financial institutions.

The scientific approach of the study corresponds with the actuality of the subject and the specialists' interest in the organizational practice, seeking the development and the strengthening of the durable systems of the employees' motivation, the remuneration in terms of results and not of the worked time.

The research theme is justified from the point of view of the role which belongs to the human resources and to the professional performances of these in the favorable performance of any activity.

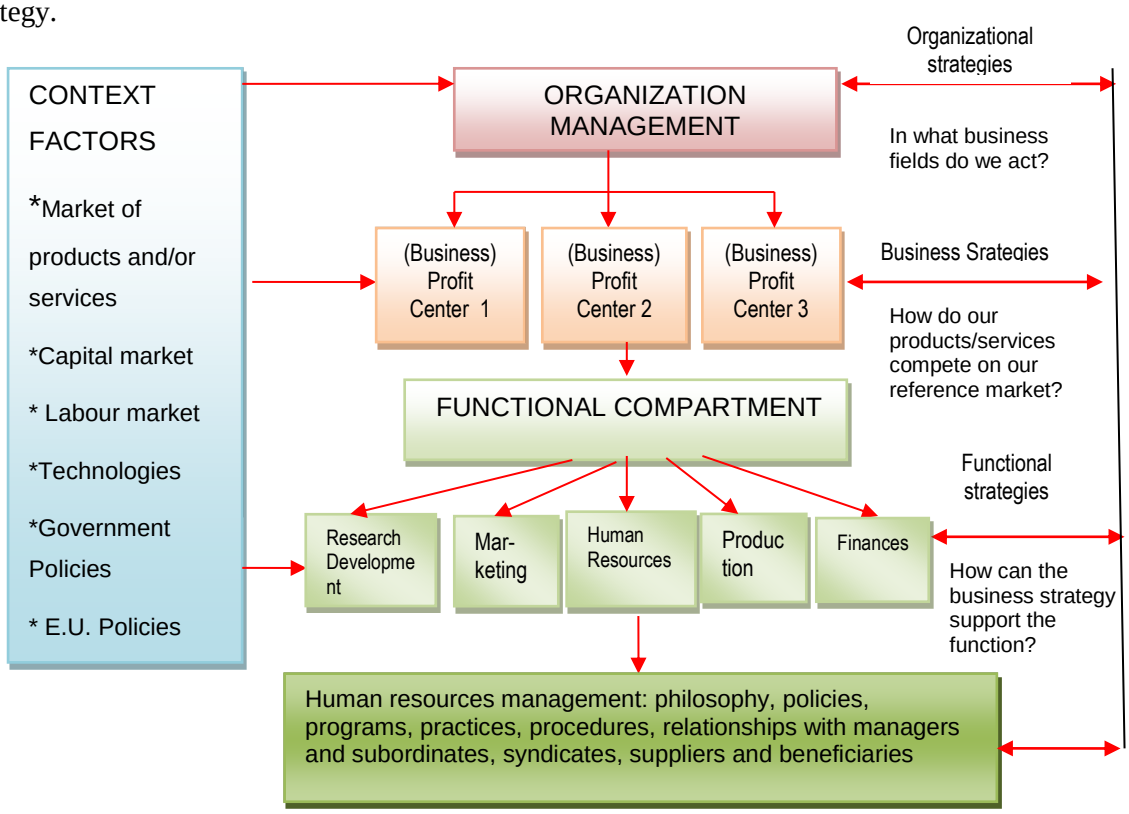
We shall start from the reality that performance, success and competitiveness of the organizations depend in large part on the quality and content of the human resources management. When we talk about the management, firstly you have to define the human resources, whereas, in all the organizations, the people are an essential resource, on which survival, evolution and competitive success of these depend. We shall strive to realize the primordial aspects of the human resources management and of the assessment of their performances, which must be relevant to the professional training actions in the human resources field.

The performance management as a component of the human resources management represents a way to obtain the better individual, group and organizational results, through the understanding and the performance management within an accepted framework of the set goals and of the requirements regarding the standards and the skills.

2. The human resources management and the organization strategy

The nature of the relationship between the human resources management strategy and the organization strategy was studied by several specialists. Among these there are Bratton, J. and J. Gold, who formulated two different conceptions regarding this link: the proactive and reactive orientation (Bratton, Gold, 1999).

The proactive orientation considers that the human resources managers and the professionals are engaged to the business strategy formulation. This concept is illustrated in Figure 1 by means of the arrows with double meaning, which represents the influence of top-down and bottom-up on the strategy.



Source: Bratton J., Gold J., Human Resource Management-Theory and Practice, Mac Millan Business, 1999

Figure 1. *Relationship between the functional strategy of the human resources and the organizational strategy*

According to the reactive orientation, the management function of the human resources is totally subordinated to the organization strategy, this determining the management policies and practices of the human resources. In this case, the business strategy is established without human resources professionals get involved, and the staff policies and practices are implemented to support the chosen competitive strategy.

The reactive orientation is represented in Figure 2 through the arrows with only one sense, from top to bottom, from the business strategy to the strategy from the functional level.

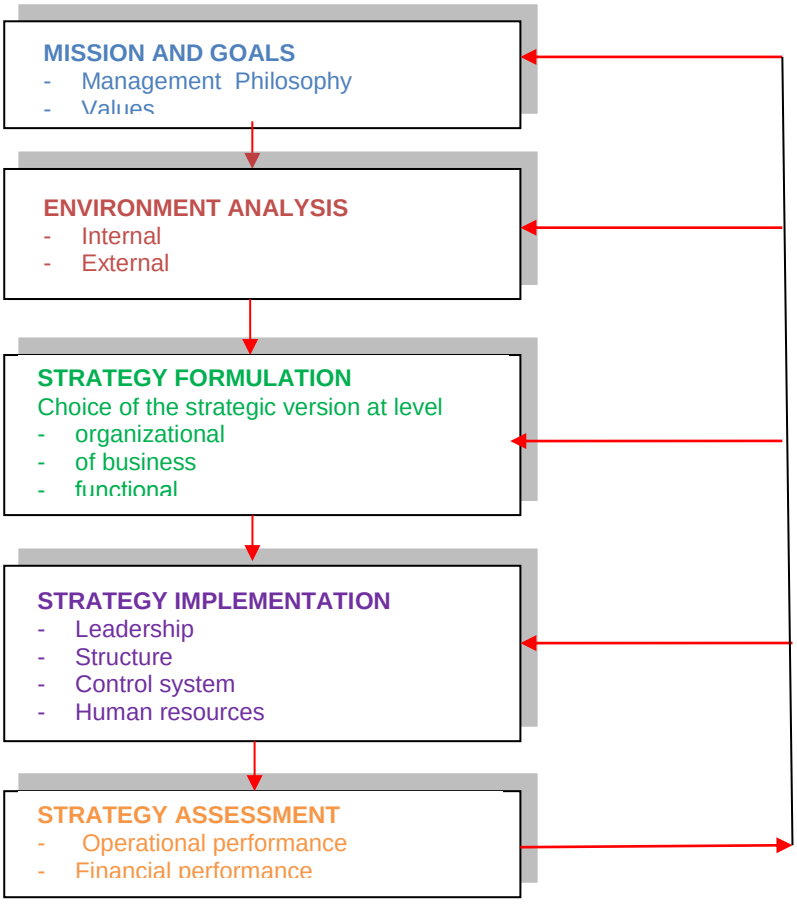
The first step of the model is the assessment by the higher management of the own positions toward the mission and goals of the organization. The mission gives the values and the aspirations to the organization, the reason to be of this.

The environment analysis involves on one side the identification of the strengths and weaknesses within the organization and on the other hand the opportunities analysis and the analysis of the improvements from the external environment of this. The most important factors for the organization future are called strategic factors and they are known under the acronym SWOT (Strengths - Weaknesses - Opportunities - Threats).

The strategy formulation consists in the assessment, by the higher management, of the interaction of strategic factors and in the choice of strategic version that helps the organization achieve its goals. Some strategies are formulated at the organizational level, others at the business level, or at the level of marketing or human resources.

The implementation of the strategy relates to activities that focus on the techniques which are used by the managers for implementing the strategy; this implementation relates to the leadership

styles which are compatible with the chosen strategies, at the information and the control systems, the structure of the organization, at the human resource management.



*Source***:** Bratton J., Gold J., *Human Resource Management-Theory and Practice*, Mac Millan Business, 1999

Figure 2. The model of the strategic management of reactive type

Kotter J. believes that "leadership is the most important part, but also the most difficult part of the implementation process of the strategy"(Kotter, 1996). The strategy assessment represents an activity that determines the measure in which the change or the obtained current performance corresponds to the desired performance or the change. Figure 2 illustrates the five main activities which are achieved by the higher management as a linear rational process. This model of the strategic management is a theoretical model that shows how the strategic management should be done and less what the higher managers do in reality.

The strategic decision contains an important political component; because of this it is possible that between the theoretical model and the reality of the strategic management be a high enough difference.

3. The performance management- the component of the strategic management of the human resources

The advent of the performance management occurred at the end of the year 1980, as reaction to the minuses of the existing performances assessment until then, grading after merit, the management by goals and the behavior assessment.

According to Armstrong, M., "the performance management is a way to get the better individual, organizational, group results, by understanding and managing the performance within an

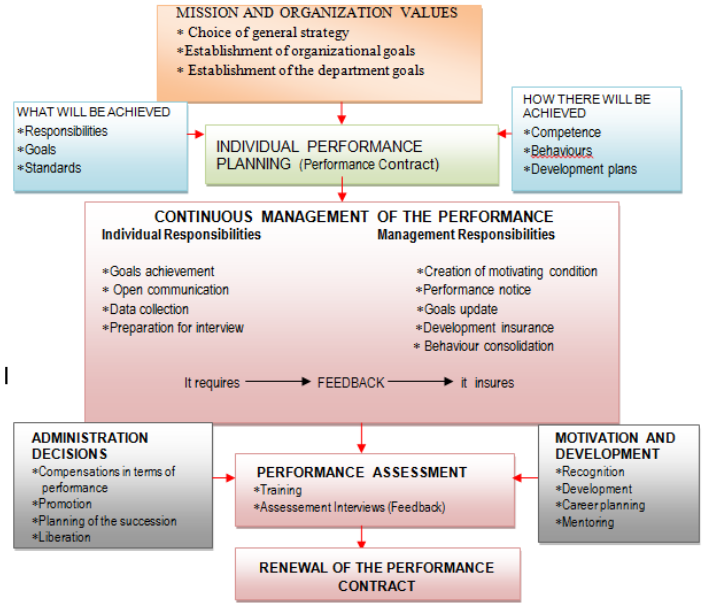
agreed framework of the planned goals and of the requirements concerning the standards and the competences" (Armstrong, 1997).

The general goal of the performance management is to establish a performance culture, where the individuals and the groups take action to improve the businesses, the contributions and the own skills.

The performance management is a process which is developed particularly for each organization, which plans to introduce it. However, for taking a decision to implement such a system, it is necessary to require the preparation of a general conceptual framework to guide the managers, groups and the employees on the activities which must be performed in a certain perspective for the well established periods.

In Figure 3 is showed a performance management model. In M. Armstrong's view, the conceptual framework of the performance management includes the following activities:

- determination of the organizational and departmental goals ;
- preparation and formulation of the mission organization and the organization values closely linked to the business strategy ;
- agreeing on tasks, responsibilities, knowledge, goals, necessary competences, the performance standards, which have as finality to conclude a contract concerning the performance which will be achieved;
- convention on the work plans and on those of personal development for improving the performance ;
- accomplishment of a systematic feedback;
- assessment of the transitory progress;
- preparation, by the employee and the manager, of the formal review of the performances, when appropriate;
- annual reassessment of the performance that will determine the renewal of the agreement on performance;
- introduction of the training and development programs which are inspired from the performance review;
- staff's professional development under the form of counseling, involvement , self-development and training on job ;
- classification or gradation of the performance;
- remuneration in terms of performance.



Source: Grote D., *The Complete Guide to performance Appraisal*, AMACOM, New York, 1996

Figure 3. The process model of the performance management

4. The characteristic notions of the performance

The human performance is closely related and conditioned of the professional competence and the human creativity. V. Belous defined performance as "impressive result which is obtained by a person, a special achievement which was obtained in a field of practice activity or a result of the human action being superior to the other known results" (Belous, 1995).

In the literature of this field, several levels of performance can be found: individual, group, local, national, continental and world performance.

When the reference system, to which the human performance is related, is attached to a particular person and in relation to this intrinsic system there is measured the same person's progress or regress, the performance is called individual performance or, in the case of regression, anti-performance or nonperformance.

In the professional field, the individual performance is analyzed basing on the results which are obtained by an employee in comparison with the performance standards which were established in advance. From an economic perspective, this result is formulated by the value added to the product or by provided service, or by improving the action on the environment. The most characteristic economic indicator that reflects the performance is the individual level of the work productivity.

In comparison with the individual performance which relates to the individual and the group performance relates and is defined in relation to the performance that is achieved at the local, national level.

Belous says that "the group performance is the optimum achievement which is collectively obtained, relative to the previous achievements within the given group" (Idem page10).

The group performance is a relative performance. Reporting to the local, national, and so on level, this very rarely coincides with the individual performance, which is an intrinsic performance. The coincidence occurs only when the individual performance which related to group is superior towards the same person's previously performed performance.

The individual performance has a huge influence on the performance degree which is achieved by the group. Taking as a starting point the link between the performance and the human action and appreciating that the efficiency of the human action is given by the achievement degree of the proposed goal; it is considered that the individual performance overlaps with the action efficiency.

The same author who was earlier mentioned, considering the report: (Eq. 1.)

Eq.1: $E = \frac{S}{C} = \frac{\sum_{i=1}^{n} Si}{\sum_{j=1}^{m} Cj}$, *where*:

E - represents the efficiency of the human action;

S. - total goal, the sum result of the elementary goals *i;*

C. - total consumption, obtained by summarizing the elementary consumptions j, it considers that "the achievement degree of the proposed goal in relation to the material or spiritual consumption is actually the efficiency of the action human "(Idem page 7).

Authors Roşca C., Roşca D., Negulescu M. C., and Neamţu M. believe that " the maximizing of the human efficiency E can be obtained by:

- the counter increase and the constant maintenance of the denominator;
- the counter increase and the denominator decrease;
- the constant maintenance of the counter and the denominator decrease"

Because the individual performance lies in the maximizing of the efficiency of the human action E, the human spirit can reach in the sphere of the over unitary efficiencies.

5. The assessment of the professional performances – case studies

The employees' professional performance assessment of an organization represents a activity of the human resources management that has an increasingly higher spreading arena which is indispensable for the knowledge-based economy becoming primordial within the management process of the human resources.

The concept of performance assessment was described by various specialists in field. Ivancevich and Glueck consider that "the performance assessment is the basic activity of the human resources management, which is performed for determining the degree in which the employees perform efficiently their tasks and their responsibilities" (Ivancevich, Glueck, 1986).

Roşca C., and Pandelică I., believe that " the performance assessment is considered as an action, a process or a particular type of cognitive activity by which an assessor believes or considers a person's performance in relation to the established standards and to her mental representation, her own system of values, or in relation to her own conception of continuous performance" (Roşca, Pandelică, 2002).

The concept of performance assessment evolved ongoing reaching to more complex definitions. Roşca C., Vărzaru M., and Roşca Gh., I., show that "the process of the professional performances assessment focuses on how the employees meet their goals, duties and responsibilities and the process regards the assessment of potential, skills, behavior, results" (Roşca, Vărzaru 2005). Pânişoară shows the performances assessment in the organization as "an important aspect of the human resources management, because through the assessment there must be understood the dynamic nature of the professional development and we perceive the professional development as a continuous process and not as a simple event occurring in the employee's life" (Pânişoară, Pânişoară, 2005).

The assessment process of the human resources performances is an important component of the performance management, a method of obtaining the superior individual and organizational results through the knowledge and performance management in a homogeneous and contextual framework.

Regarding the categories of assessors, the theory and the practice from the field of the human resources management indicate the fact that in the process of the performances assessment the first place is occupied by the assessor.

According to Anderson and Herriot's opinions "an important aspect, which was treated extensively in the speciality literature, is that of the categories of assessors who can perform the performances assessment". (Anderson, Herriot 1994)

The performances assessment acts after the hierarchy principle, namely the individual's performance will be measured by his direct superior, the performances of a subdivision will be measured by the next hierarchical level and the organization performance by the top management.

The performances assessment can be performed by the persons who are located in different positions in the structure of the organization, or towards the assessed employee. So there are known the following types of assessment:

- assessment which is achieved by the managers (direct heads);
- assessment which is achieved by the direct subordinates (upward assessment);
- assessment which is achieved by the equals (colleagues);
- evaluation which is achieved by the assessment committee;
- self-assessment;
- assessment which is achieved by the external assessors.

Regarding the methods and techniques of performances assessment Manolescu A. believes that "the necessity of the staff appreciation or the necessity of the performances assessment in work, regardless of the activity field, determined eventually the elaboration of the numerous methods and techniques for assessing the staff or determined the appearance of the performances assessment systems. Thus, many specialists tried to answer, in fact, not only to the questions about why we assess or who must do the performances assessment, but also to the question: "What are the specific methods and techniques or the most appropriate systems of the performances assessment?" (Manolescu, 2003).

Thus, the management theory and practice in the human resources field highlight the numerous classification attempts of the methods and techniques of the performances assessment, as follows:

- assessment scales:
  - graphic scales of assessment;
  - assessment scales with multiple steps;
  - standardized scale;
  - scale on points;
  - assessment scales being focused on behavior;
  - scales of behaviour observation.

- comparative methods of performance assessment:
  - simple comparison or hierarchy;
  - comparison on pairs;
  - comparison through the forced distribution.
- technique of the critical incidences;
- method of the verification or control lists;
- written essays;
- analysis of a certain field;
- tests of skills, personality or performance;
- management by goals.

The practical part of this paper focused on the assessment method of the employees' professional performances, these employees being from the General Directorate of Public Finance of Dolj (DGFP).

The DGFP employees, who are called public servants, perform the following activities:

- issuing the projects of legislative acts and other regulations of the own authority or of the public institution and notification insurance of these;
- putting in force of laws and other legislative acts;
- redaction of projects, policies and strategies, programs, studies, analyses and statistics being useful to achievement and implementation of the public policies;
- management of human resources and financial resources;
- control, counseling and internal audit in public sector;
- collection of budgetary debts;
- execution of activities in accordance with the computerization strategy of the public administration;
- interests representation of the public institutions or public authority in the reports of this with the natural or legal persons of public or private law, in the country and abroad, within the limits of the competences which are determined by the head of the institution or public authority, as well as the representation in justice of the public authority or institution in which they perform their activity.

In terms of the duties level of the holder of public function, the public functions are divided into three categories as follows:

- the public functions corresponding to the category of higher public servants;
- the public functions corresponding to the category of managerial public servants;
- the public functions corresponding to the category of execution public servants.

The public servants' individual professional performances assessment arte achieved by the assessor who can be:

- managerial public servant who coordinates the section where the execution public servant achieves his activity or who coordinates the activity of this;
- managerial public servant who is hierarchically superior according to the organizational structure of the authority or public institution, for the managerial public servant;
- high public servant, for the managerial public servants from subordinate or for the execution public servants, when they achieve their activity within the sections which are not coordinated by a managerial public servant, excepting the case in which there is a direct report of subordination with the head of the public institution or authority or with the head's assistant;
- Mayor, on a proposal from the local Council for the commune, for the secretary of the village, town and of the administrative-territorial subdivision of the municipalities;
- Head of the public authority or institution or his assistant, for the public servants who are directly subordinated to the latter.
- The public servants' individual professional performance assessment is annually made, the assessment period being between the 1st of January to the 31st of December from the year for which the assessment is made and between the 1st and 31st of January of the following year of the assessed period.

The components of the public servants assessment are as follows:

- the assessment of degree and achievement way of the individual goals;

- the assessment of the accomplishment degree of the performances criteria.

To assess the employees' work in the public finances there are used the following methods and techniques:

- the inventory of strengths and weaknesses related to the requirements of the consigned function;
- the noting;
- the professional balance sheet in relation to the goals of the previous period of the assessment.

In the system of public finance the performance standards are determined before the beginning of the activities which are assigned to the job, so that those who are involved know the requirements of the proposed goals achievement.

The individual goals must meet the following requirements:

- they must be specific to the activities implying the exercise of the public power prerogatives;
- they must be quantifiable;
- they must have the times of achievement;
- they must be realistic;
- they must be flexible.

For each of the established goals the assessor will establish the performance indicators.

The individual goals and performance criteria noting is made going through the following stages:

- each goal will be assessed with the grades from 1 (minimum level) to 5 (maximum level), the grade expressing the achievement degree of the respective goal, in relation to the performance indicators;
- each performance criterion will be assessed with the grades from 1 (minimum level) to 5 (maximum level), the grade expressing the achievement assessment of the performance criterion in the achievement of the established individual goals.

To get the grade which is awarded for the goals achievement there is made the arithmetic average of the awarded grades for the achievement of each goal, including the revised individual goals achievement, if there was imposed their review during the assessed period. To get the awarded grade for the achievement of the performance criteria there is made the arithmetic average of the grades which are awarded for the achievement of every criterion.

The final score of the annual assessment is the arithmetic average of the grades which are obtained for the individual goals and for the performance criteria.

In the assessment process of the individual professional performances for the employees from the public finance system there will be taken into account the following criteria:

1. The accomplishment degree of the performance standards. This criterion is based on an objective and systematic consideration of: work quality, yield, initiative, behaviour, creativity, efficiency, ethics and professional ethics.
2. The responsibility assumption, which involves:

a) for the managerial positions: managerial communication way, managerial behaviour, decision risk and level, teamwork;
b) for execution positions: the efficiency in the works achievement, the degree of involvement in the execution of the work tasks;

3. The adequacy to the work complexity which is expressed by:

a) the ability of analysis and synthesis: the identification of the description variants of processes, phenomena, analyzed forms, the determinations and influences recognition, the construction of the studied methods;
b) the routine and teamwork activity, being individualized through the high degree of responsibility of the achieved operations and through the achievement of rigorously regulated operations;
c) the ability of conception, namely: the construction and integration of the options, the interpretation of an increased volume of information.

4. The initiative and creativity. This criterion follows the professional performance assessment when the employee proposes new solutions, or the replacement of some regulations in the sphere of its activity. The content of this criterion supposes:

a) when the new solution are proposed: ideas motivation, results assessment, achievement of the studies with the application in a regulated conjuncture;
b) in the situation of the proposal of some changes: changes sizing, assessment of the repercussions of these changes, the execution of studies in the regulated conjuncture.

The professional performances assessment is continuously achieved, depending on the requirements of the occupied position.

The assessment is systematic and self-regulator and it is managed by the human resources compartment. The assessment procedure requires an open dialogue between the assessor and the assessed, which highlight:

- how much the assessor's activity contributes to the achievement of the performances of the compartment and institution in which they integrate;
- what there is on the first place in the assessor's activity.

It is recommended that during the entire period of assessment there be a permanent contact between the assessor and the assessed, so as to achieve an effective assessment for the both sides.

The assessment leaves from the criteria of individual performance assessment at which there is given a share expressing the importance of each criterion in the conjuncture of the employee's activity, as follows:

- the accomplishment level of the performance standards: it has the greatest importance in the overall assessment and it has a share of 50%;
- the criterion of assuming responsibilities has a share of 30% in the overall assessment of the individual professional performances;
- the initiative and the creativity have a share of 10%;
- the adequacy to the work complexity has a share of 10%.

Each of the showed criteria receives a grade from 5 to 1, having the following meanings: grade 5 – very good; grade 4 – good, grade 3 – to standards level, grade 2 – satisfactory, grade 1 – unsatisfactory.

The activity assessment is mentioned in the Assessment form which has a multiple character whereas the grades are given by:

- the employee, through the self - assessment procedure;
- the immediately hierarchical head;
- a colleague with the same function and the same degree and performing the same works or the similar works;
- the institution manager who establish the final grade, taking into account the three previous assessment. This manager cancels the extreme values of the grades which are assigned to each criterion and he records the grade which will become definitive and he will take into account of this definitive grade in order to obtain the total score.

Below I drew up The Assessment Form of the professional performances which belongs to an employee of the DGFP Dolj, having the position of I A degree expert, whose name is fictional for preserving the confidentiality.

ASSESSMENT FORM

Held position: Expert of I a degree
Scoring of the position: between 4 and 5; average 4.5
Assessment result: 4.4 Assessed Period: year 2012

No. crt.	Assessment Criteria	Share awarded criteria %	Grades awarded by				Scoring of criterion
			Self assessment	Directly Head	Colleague	Manager	Maximum
0	1	2	3	4	5	6	7
1	The achievement degree of performance standards	50	5	4	4	4	2,0

2	Assuming responsibility	30	5	5	5	5	1,5
3	Adequacy to the work complexity	10	5	5	5	5	0,5
4	Initiative and creativity	10	5	4	2	4	0,4
5	Total score	100	x	x	x	x	4,4

The final assessment procedure is performed in the following three stages:

- completing of the assessment report by the assessor;
- interview;
- counter signing of the assessment report.

In order to fill in the assessment report of the public servants' individual professional performances, the assessor has the following attributions:

- he establishes the final mark of assessment of the individual professional performances;
- he records the public servant's notable results, the objective difficulties which are met by this in the assessed period and any other observations that he considers remarkable;
- he determines the professional training needs for the next year of the assessed period;
- he sets the individual goals for the next year of the assessed period.

The interview, as a stage of the assessment process, is a change of information between the assessor and the public servant, in which:

- the assessed public servant will be informed about the records which were made by the assessor in the assessment report;
- the assessment report is signed and dated by the assessor and the assessed public servant.

The assessed person is informed about of the assessment result, and when this does not agree with the made assessment, this has the right to make contestation. If between the assessed public servant and the assessor there are divergences of opinion on the made records, the public servant's the comments will be recorded in the assessment report. The head of the public institution solves the contestation basing on the assessment report and on the reports which are elaborated by the assessed public servant, the assessor and by the counter signatory.

The public servant is informed about the contestation result in 5 calendar days from the resolution of the contestation. The assessor can change the assessment report if they reach to a common point of view. The final mark of the assessment is determined basing on the final grade, as follows: between 1,00 - 2,00 – unsatisfactory, between 2,01 - 3,50 – satisfactory, between 3,51 - 4,50 – good, between 4,51 - 5,00 – very good.

These marks, which are obtained at the professional assessment, are takes into account for:

- the promotion in a high public position;
- the releasing of the public position.

The assessment report shall be sent to the counter signatory. When the quality of assessor belongs to the authority or public institution, the assessment report is not countersigned.

In the previously shown example, the assessment result shows the fact that the studied employee, by obtained grade "4.4", received a "good" mark and he is within the reported limits of the position score, which means that this employee corresponds to the occupied position.

Concerning the professional improvement of the public servants' activity, this is achieved through the medium of the School of Public Finance and Customs (SFPV) which is established on the basis of the collaboration project between the Ministry of Finance of Romania and the Ministry of Finance of the Netherlands, this project being performing during the period from September 1999 to January 2002.

SFPV insures a permanent and sustainable infrastructure of staff training from all the structures of the Ministry of Public Finance (MPF) in order to improve the ability of the Ministry to achieve its specific functions and it has the following tasks:

- the elaboration of the strategy and unitary methodology of the professional training in MPF;
- the coordination and the methodological guidance of the professional training processes execution in all the structures of the MPF, including those structures which are subordinated to the Ministry, as well as guaranteeing a high standard of quality of these processes at the level of the EU requirements;

- the coordination of planning, organization, monitoring and assessment of the employees' professional training, these employees being from central and territorial structures of the MPF.

The employees' professional training is achieved through three main forms:

- the courses which are organized in a centralized way by SFPV;
- the experts' participation at the trainings which are organized by the other institutions in the country or abroad;
- the professional training which is organized at the level of the county DGFP and at the employees' job.

The training methods are the following:

- the classical training, namely the training in physics class;
- the e-learning, namely distance learning. In the period 2003-2008, SFPV performed in the e-learning modality in the following themes: The application of the legal provisions in force concerning the purchases; European Affairs; Income tax; Guide of professional ethics; The collection of tax claims through the specific performance; Project Management; Pedagogical skills in the adults training; Strategic planning; Communication; English (beginner level);
- the training at the job or the self-training.

To improve the work which is done by the employees of Dolj DGFP there were made the following proposals:

- the improvement of the ONYX - PERSONAL SGDB ORACLE computer subsystem for the efficient use of the resources and reducing the execution time of the works;
- the data-processing program must allow the achievement and listing of reports and situations which are often used by MPF, the National Agency for Fiscal Administration (NAFA) and by the National Agency of Public Servants (NAPS), and it also allows the statistical reportings achievement and listing and the implementation of an unitary program of human resources management and calculation of salaries in order to avoid the work on parallel databases.

Conclusions

Starting from the role that the human resources have in any organization, in the present paper we surprised the main aspects of the human resources management and of the performances assessment of these. The development of theory and practice in the human resources management requires the perfect knowledge and understanding of the role and of the human resources specificities within the organization.

For this purpose I presented the two orientations which are developed by authors Bratton J. and J. Gold, referring to the relationship between human resources management strategy and the organization strategy, namely: proactive orientation and reactive orientation.

Further I defined the concept of performance management, whose appearance happened at the end of the year 1980, I illustrated the process model of the performance management, developed by Grote in 1996 and I described the activities which are comprised by the concept framework of the performance management. The professional training and the continuous development of it become a priority both for the company and for the employee in order to achieve the performance.

Knowledge, skills, attitudes, motivation, employees' individual features are those that provide to the organizations the foundation for achieving the efficiency.

The changes at economic, social, demographic, technological level generate a dynamic external environment and sometimes it is difficult to predict this environment for the contemporary organizations.

In the final part of the paper I deal with the concept of professional performance at the financial institutions level, pointing the distinctive features of the professional performances assessment, the categories of assessors and the methods and techniques of the professional performances assessment.

The practical side centered on DGFP Dolj employees' professional performances assessment, these having their own system of professional performances assessment.

For this purpose, I described the public servants' activities, the classification of the public functions, the assessors categories and their main tasks, and the employees' assessment methods of the institution in question.

I presented the criteria underlying the jobs assessment in the field of public finances and the performance standards which are determined before the beginning of the required activities of the job, so that those who are involved must know the achievement requirements of the proposed goals. One who achieves the assessment must establish the content of performance indicators for each of the goals.

The assessment procedure requires an open dialogue between the assessor and the assessed, and it involves the assignment of a share to each assessment criterion of the individual performance, this share expressing the importance of the respective criterion in the employee's activity situation.

For example I drew a model of assessment form of an employee's professional performances, this employee being from DGFP Dolj and having the function of Expert Title I A.

The assessment form contains: assessment criteria, share criteria given in percentages, the grades provided by the directly head, colleague, manager and the grade which is awarded by the employee himself, finally determining the criterion score by multiplying the share which is accorded to the criteria in percentages with the grade which is awarded by the directly head and all is divided at one hundred.

The assessment result denotes that the employee who is studied, through the obtained grade (4.4) received the mark of "good" and he fits between the limits which are reported by the job score, which means that this corresponds to the occupied job.

At the end I presented the public servants' professional perfection forms, pointing the fact that within the DGFP Dolj the public servants' professional training is achieved with the help of the School of Public Finances and Customs (SFPV), through three ways: classical training, e-learning, training at the job.

There also were made the proposals for improving the activity through: the optimization of the informational subsystem ONIX-SGDB ORACLE PERSONNEL for the efficient use of the computer programs and the reduction of the papers execution using the information from the staff database.

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