## The natural regulator

*"Money has complicated the economic way of thinking*
*and has changed the rational oversight over the material order."*

Economics emerged as a method for establishing rational cognition in the exploitation of the opportunities found in the material order. The most significant aspect is that it hasn't insisted much on deciphering the natural manifestations of this order: the most prominent innovations of Economics were of an artificial nature.

Among these innovations, the most important role is played by money. Fatally, money has complicated the economic way of thinking and has changed the rational oversight over the material order. It has generated the operational structures which have favoured the abandonment of the drive to understand the consequences of utilizing to the limit the determinants of the natural material order. At the same time, the artificial order built on the structure of money has radically shifted the sense of the human action, which would now destroy the substance of the natural order for the purpose of sustaining performance in the artificial order.

The first consequence was that the market, as a regulator of the economic action, got to be viewed exclusively in monetary terms. For the elements of the natural order of the human action – such as offer and demand – the economic space of reasoning has an artificially structured regulator. It is as if the path of the vital sap from the roots of a tree to its fruits would pass through a plastic pipe, instead of through a natural trunk.

When described in monetary terms, the demand is not only alienated from its substance of the natural order (which is that of subsistence, or generally that of comfort), but it is severed from its cause and its vital functions. Its generic impulse comes from a will to make it unconditioned by life. Without being linked to life, with the state of grace in the natural, the human action tends to break away from its natural determinants. The functions of demand serve an illusion, the one of possibilities multiplied without limit by the expansion of the artificial offer. In these conditions, the mechanism as a regulator of economic action functions in a non-deterministic way.

Without any natural limitations, the game of offer and demand is practically no longer structured on the space of economic rationality. It is no fluke that it is now a rule for the production of added value to take place outside the intrinsic circuits of economic rationality. The underground economy, rent seeking, virtual money, the black market, the dual banking system etc. are all responsible for the most profitable part of the global economy. These are the exclusive configurators of the global order, concentrating wealth, generating debt and maximizing the risk of social polarization.

What was meant to be a regulating mechanism in rational terms, turned out to be a functional one in irrational terms. As such it is not the calculation which sets the path of the human action, but the manifestation of the psyche with regard to expectations, beliefs, sentiments and illusions. From here onwards it was easy for the irrational exuberance to become the source of profit, for notoriety to explain performance, for the stimulation of trust to create mass-choice and for the ritualization of decision making to anchor the finality.

Economics plays the role of the magic of the artificial, overturning the economic way of thinking. The regulating mechanism is composed of elements which sit contrary to the logic of the space of economic rationality.

The most puzzling thing is that Economics does not recognize that the sense of its cognition is given by the source of the randamental human action, by the man already driven by the vagaries of life to satisfy the needs pertaining to the natural order. It resembles a neurotic situation. The determinants of rational action should not have to confront and to be moderated by elements belonging to another order, because they essentially belong to the human nature, to the natural order specific to the species. The structuring of the space of economic rationality has a regulator which eminently originates in the human nature. The economic way of thinking settles around an element of the human nature. This natural regulator lends a normal sense to the human action, it institutes the rules for the logic of this action. This regulator is the common sense.

Centring the randamental human action on common sense constitutes the only possibility for human action to remain within the perimeter of the natural material order. Any other elements destined to become the object of human action, like the ones meant for intermediating needs such as money, would keep their status as means, as working instruments. They will also not become means in themselves, replacements for the elements of the natural order, of life.

The randamental human action can only reach the goals encapsulated in the human nature with the help of the means of the natural material order. The measure of the randamental human action is the measure of the human nature,

which is the common sense. Otherwise everything would sit outside the natural material order and an empire of the self-sufficient artificial would be built, an empire would be contrary to the only authority which institutes and certifies the logic of the human action: life.

It has been said since ancient times that man is the measure of all things, either good or bad. The measure of human nature, for all it has which is either good or band, is the common sense. It is the centre around which gravitates everything pertaining to the human nature. Reality is configured according to its essentially human nature. Human action, which is started by the rational impulse of the human nature, is recognized as economic action. This one is not radically different in its determinants from the consequence of the will for doing, which is specific to the human nature. The economic state of rationality is itself a natural consequence of the regulator of the human action, which is the common sense. Thus, everything would belong the magical and rationality would be extra-human.

The multi-stratified currency sphere of today eclipses the light necessary for the finality of the randamental human action and it turns the planet of human nature into a desert of speculation. Under the thick cover of the currency sphere, the human nature manifests unnatural behavioural tendencies; it accepts extreme consequences or turns the universe of its feelings into robotic mechanisms. Taking the human nature out of the control of the artificial, its regeneration and the re-founding of the natural order demand the use of a natural regulator. Common sense is the only solution. The rest was proven nothing but delusion.

Marin Dinu

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# Assessing fiscal sustainability in some selected countries

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**Abstract.** *The aim of this article is to assess the sustainability of fiscal policy in 18 developing and emerging countries, using the recursive algorithm developed by Croce and Juan-Ramón (2003). In general, the results suggest that most countries were identified as presenting large unsustainable fiscal positions in the period considered, explained basically by primary fiscal deficits. Interestingly, results for Panama suggest no evidence that officially dollarized countries run more prudent fiscal policies than non-officially dollarized countries.*

**Keywords:** debt, deficit, fiscal sustainability.

**JEL Classification:** E62, H62, H63.
**REL Classification:** 8K, 8H.

## 1. Introduction

In the last two decades, long-run sustainability has moved to centre stage in the analysis of fiscal policy. The idea of fiscal sustainability is intimately related to the dynamics of public debt and has regained relevance in the world due to the sovereign debt problems in European countries as a result of the global financial crisis. The economic literature provides us with a series of indicators for analyzing fiscal sustainability. One of the most used indicators is the public debt to gross domestic product (GDP) ratio. A fiscal policy is unsustainable if it causes the debt to GDP ratio to grow without limit. The concern here is that a debt that grew without limit would eventually become unmanageable, leading to some unpleasant consequences like default, high inflation, forced fiscal austerity or restrictive monetary and/or fiscal policies. Some authors find that emerging and developing countries have a lower tolerance for sovereign debt, with defaults at much lower levels of public debt to GDP (Reinhart, Savastano and Rogoff, 2003). Fiscal sustainability analysis has thus become a key element of macroeconomic analysis, particularly for emerging and developing countries.

The aim of this paper is to assess fiscal sustainability in some developing and emerging countries. To do that, the alternative approach proposed by Croce and Juan-Ramón (2003) is employed to measure the fiscal sustainability of each country. Croce and Juan-Ramón (2003), present a recursive algorithm derived from the law of motion of the debt to GDP ratio to analyse the sustainability of fiscal policy.

Quarterly data for a sample of the following 18 developing countries is presented: Argentina, Brazil, Chile, Colombia, Costa Rica, Czech Republic, the Dominican Republic, El Salvador, Honduras, Hungary, Indonesia, Malaysia, Mexico, Panama, Peru, Philippines, Thailand and Turkey. This selection of countries has been dictated by data availability. Fiscal policy was also a relevant criterion in terms of public debt, composition and variability of public expenditures in the sample. The inclusion of Panama allows an evaluation of whether official dollarization encourages prudent fiscal policies and lowers public debt.

The remainder of this paper is organised as follows: Section 2 provides a brief review of the literature discussing fiscal sustainability. Section 3 discusses the fiscal sustainability indicators. Section 4 describes the sets of data obtained and presents results. Finally, Section 5 presents the concluding remarks.

## 2. Fiscal policy sustainability: literature review

The idea of fiscal sustainability is intimately related with public debt dynamics. Rapid accumulation of debt (external and/or domestic) can lead to severe

macroeconomic problems, impeding the control of the fiscal deficit itself. One concept of sustainability relates to solvency. A fiscal policy is sustainable if it leads to solvency, and solvency is defined as a situation in which the future paths of spending and revenue satisfy the inter-temporal budget constraint. In other words, solvency is the ability of the government to service its debt obligations in perpetuity without an explicit default (IMF, 2002; Croce and Juan-Ramón, 2003). Another concept of fiscal sustainability relates to the government's ability to maintain its current policies while remaining solvent (Burnside, 2004)[(1)]. The design of indicators on fiscal policy sustainability thus constitutes a key endeavour in economic analysis and is particularly relevant for emerging and developing countries. Numerous researchers have devoted considerable efforts in constructing appropriate indicators of fiscal policy sustainability (see Horne, 1991).

Early literature on fiscal sustainability is produced by Buiter (1985); Hamilton and Flavin (1986); Blanchard (1990) and Blanchard et al. (1990). Measures of fiscal sustainability are proposed by Buiter (1985), estimating that the annuity value of the discrepancy in the government's ex ante balance sheet or the permanent adjustment needed to maintain a constant ex ante share of public sector net worth to trend output. Hamilton and Flavin (1986) study issues of fiscal policy sustainability and empirical testing for government intertemporal budget constraints. Moreover, Blanchard (1990) attempts to assess whether the present value budget constraints could be met in an "ex ante" sense over the course of a specified planning period. Blanchard (1990) defines a sustainable fiscal policy as one which ensures that the government is intertemporally solvent. Similarly, Blanchard et al. (1990) define sustainable fiscal policy as a policy as such that the ratio of debt to Gross National Product (GNP) eventually converges back to its initial level. They suggest a set of indicators in the sustainability of fiscal policy, designed to assess the extent to which governments can maintain current tax and spending programmes without experiencing a continued increase in public debt. According to these authors, a good indicator of sustainability is one which sends clear and easily interpreted signals when current policy appears to be leading to a rapidly growing debt to GNP ratio[(2)].

While early literature on fiscal sustainability is mostly focused on industrial countries, more recent developments focus on fiscal sustainability in emerging markets and developing countries, incorporating elements of financial frictions (Calvo et al., 2003; Galindo and Izquierdo, 2003) and stochastic and recursive methods (Chalk and Hemming, 2000; Xu and Ghezzi, 2002; IMF, 2003; Barnhill and Kopits, 2004; Croce and Juan-Ramón, 2003; Hostland and Karam, 2005; Mendoza and Oviedo, 2006; Celasum et. al., 2007, and others)[(3)]. Calvo et al. (2003) argue that a sudden stop in capital flows is a key determinant of fiscal sustainability. A foreign or domestic shock triggers a sudden stop that can force

abrupt adjustments in current account deficits that may require a large depreciation of the real exchange rate, and the latter can compromise the ability to service public debt and result in sharp declines in sustainable debt-output ratios(4). Similarly, Galindo and Izquierdo (2003), based on work by Calvo et al. (2003), demonstrate that a large depreciation in the real exchange rate can lead to fiscal sustainability problems, particularly in relatively closed, highly indebted and heavily dollarized emerging markets. Hence, in the presence of large temporary fluctuations in the real exchange rate, a reading of the fiscal situation based on standard fiscal indicators may lead to a severely distorted assessment of fiscal sustainability. This suggests the need to develop alternative fiscal indicators. In that order, Talvi and Végh (2000) propose an indicator of fiscal sustainability based on a macro-adjusted deficit, which is defined as the level of primary deficit which would prevail under "normal" macroeconomic conditions(5).

On the other hand, Chalk and Hemming (2000) demonstrate that in the presence of non-renewable resources, sustainability would require equalising a country's net worth (including the value of non-renewable resources) to the present net value of primary non-resource deficits. This method highlights the fact that increasing resource exploitation to pay debt would not affect sustainability. Xu and Ghezzi (2002) model the flows in government budgets as stochastic processes in order to estimate default probabilities. They develop a method for pricing government debt and calculating fair yield spreads. Moreover, the IMF (2003) proposes a stochastic simulation approach that computes the probability density function of possible debt-output ratios. The IMF's stochastic simulation model is based on a non-structural time series analysis of the macroeconomic variables that drive the dynamics of public debt.

Barnhill and Kopits (2004) use a stochastic approach based on the value-at-risk model to address the ways in which macroeconomic volatility and contingent liabilities affect fiscal sustainability. It is applied to the case of Ecuador and shows that the volatility of the sovereign spread is a major source of fiscal vulnerability and is more important than terms of trade shocks. In this sense, there are instances in which the behaviour of creditors is the determinant of sustainability.

Croce and Juan-Ramón (2003) develop a recursive model aimed at deriving a fiscal policy rule that is observable by external analysts and indicates whether a country is adopting a sustainable policy stance. They derive primary surplus and discount rate that would prevail when a country reaches its target debt to Gross Domestic Product (GDP) ratio and then construct a fiscal sustainability indicator allowing these variables to react to shocks that move the debt to GDP ratio out of its equilibrium value. Based on quarterly estimates of this algorithm in the 1990s, 12 developed and developing countries are ranked according to their degree of

sustainability. For a number of countries, authors find evidence of causality between the fiscal policy stance and growth-adjusted real interest rates. They also explore how different types of public expenditures affect fiscal sustainability. Their results show that unsustainable countries experienced larger increases in certain categories of public spending as a percent of GDP (wages, subsidies, and other current transfers) than countries classified as sustainable.

Moreover, Hostland and Karam (2005) apply stochastic simulation methods to assess debt sustainability in emerging market economies and provide probability measures for projections of debt burden over the medium term horizon. They show that the vulnerability of external debt is sensitive to the determining of the exchange rate and to the pricing of traded goods. Mendoza and Oviedo (2006) apply stochastic simulation methods in a dynamic general equilibrium modelling framework where co-movement between macroeconomic variables is determined by an explicitly theoretical structure. These authors demonstrate how the stochastic behaviour of revenue flows affects the average ability of a government to borrow(6).

Celasum et al. (2007) propose a probabilistic approach to public debt sustainability analysis using fan charts. These authors have developed a stochastic algorithm for generating and explicit risk analysis of debt dynamics, and applied it to five emerging market economies (Argentina, Brazil, Mexico, South Africa and Turkey). They show how the fan charts and sustainability indicators can be used to guide policy makers in making judgments about whether the present course of fiscal policy will, or will not, lead to a crisis down the road. The authors also introduce fiscal reaction functions, an important shortcut to modelling the dynamic properties of fiscal policymaking. Moreover, Frank and Ley (2009) modify several assumptions in the probabilistic approach to fiscal sustainability proposed by Celasum et al. (2007). They allow for structural breaks in the data generation mechanism, through the application of Markov-Switching models. These methodological modifications have significant impacts on the results for specific country cases. Similarly, Budina and van Wijnbergen (2009) use a stochastic simulation (Monte Carlo) for the high volatility of key variable for Turkey, and develop a Value at Risk approach to fiscal sustainability analysis. The fiscal sustainability tool incorporates an endogenous debt feedback rule for the primary surplus, a fiscal policy reaction function. The results suggest that an important fiscal adjustment, with primary surpluses, is relevant to a decline in public debt (as a share of GDP). Moreover, Belhocine and Dell'Erba (2013) use a measure of debt sustainability (the difference between the debt stabilizing primary balance and the actual primary balance) in an otherwise standard spread regression model applied to a panel of 26 emerging market economies. These authors find that debt sustainability is a major determinant of spreads with an

elasticity of about 25 basis points for each one percentage point departure of the primary balance from its debt stabilizing level. Their results suggest that policymakers in emerging economies should adopt prudent fiscal policies that keep public debt levels low in order to avoid a potentially damaging rise in their sovereign spreads.

On the other hand, the international financial crisis has again put the sustainability of public debt in the advanced economies agenda. Ghosh et al. (2013) develop a new framework for assessing debt sustainability in advanced economies. They use a stochastic model of sovereign default in which risk-neutral investors lend to a government that displays "fiscal fatigue", whereby its ability to increase primary balance cannot keep pace with rising debt. Using data for 23 advanced economies over the period 1970-2007, they find evidence of a fiscal reaction function with theses features, and use it to compute "fiscal space", define as the difference between current debt ratios and the estimated debt limits. Similarly, Greenlaw, et. al (2013) examined sovereign debt dynamics, using panel data set on 20 advanced economies and case studies to Greece, Ireland, United States, and other European countries. The authors conclude that countries with debt above 80% of GDP and persistent current-account deficits are vulnerable to a rapid fiscal deterioration as a result of these tipping-point dynamics.

## 3. Methodology

In this section, the recursive algorithm developed by Croce and Juan-Ramón (2003) is reviewed in detail. The starting point is government intertemporal budget constraints. To facilitate the analysis, it is assumed that net privatisation proceeds, public revenue from the creation of money (seigniorage) and revaluations of assets and liabilities are equal to zero. The financing needs of the public sector are defined as:

$$PSBR_t = \left(D_t - D_{t-1}\right) = PD_t + i_t D_{t-1} \qquad (1)$$

where $D_t$ is the stock of total public debt (domestic and foreign), $PD_t$ is the primary deficit and $i_t$ is the nominal rate of interest payments. Equation (1) shows that the change in the stock of public debt (domestic and foreign) is induced by the public sector borrowing requirement (PSBR) at time *t* to finance the primary deficit and the interest payments on public debt. Multiplying both sides of equation (1) by -1, the following is obtained:

$$PS_t = i_t D_{t-1} - \left(D_t - D_{t-1}\right) \qquad (2)$$

where $PS_t \equiv -PD_t$ , that is $PS_t$ is the primary surplus of the public sector. Equation (2) can be expressed as a fraction of the nominal Gross Domestic Product as:

$$d_t = \beta_t d_{t-1} - ps_t \qquad (3)$$

in which $d_t$ is public debt as a proportion of GDP (the law of motion in the debt to GDP ratio), $ps_t$ is the ratio of the primary surplus to GDP, and $\beta_t = \frac{1+r_t}{1+g_t}$, $r_t$ is the real interest rate and $g_t$ denotes the rate of growth of real output(7). Equation (3) states that, in the absence of shocks and corrective policies, public debt as a proportion of GDP $(d_t)$ increases over time in the presence of persistent primary fiscal deficits in joint with a real interest rate higher than the growth rate of real GDP(8).

Intertemporal budget constraints for the public sector can be constructed from equation (3). For simplicity, it is assumed that $\beta_{t+N} = \beta$ that is, the discount factor will be constant from time $t$ to time $t+N$ , and solving equation (3) forward recursively for $N$ periods, we obtain:

$$d_t = \beta^{-1} ps_{t+1} + \beta^{-2} ps_{t+2} + \cdots + \beta^{-N} ps_{t+N} + \beta^{-N} d_{t+N} \qquad (4)$$

This intertemporal budget constraint indicates that the initial stock of public debt should be equal to the discounted present value of the sequence of public primary surpluses from time $t$ to time $t+N$ . Using equation (4) the following definition can be stated: the public sector is said to be solvent if the planned trajectory of the primary deficit, from time $t$ to time $t+N$ , satisfies the intertemporal budget constraint (equation 4). The above definition implies that $d_{t+N} = 0$ , that is, the public sector cannot be a net debtor in present value terms. This represents a strict condition for solvency, requiring the primary balance to become positive at some point. Alternatively, a less stringent condition for solvency can be derived by imposing weaker conditions on equation (4). We assume that $d_{t+N} = d^*$ , where $0 < d^* < d_t$ . Thus, the present value of expected primary surplus ratios will reduce the debt ratio below the current level. To construct an indicator of fiscal sustainability, Croce and Hugo Juan-Ramón (2003) suggest the equation (3) and two additional equations: target variables and the government reaction function. First of all target variables are defined as:

$$ps^* = \left(\beta^* - 1\right) d^* \tag{5}$$

where $ps^*$ and $\beta^*$ are, respectively, the primary surplus ratio and the discount factor that would prevail once convergence to the target debt ratio $\left(d^*\right)$, is achieved. Secondly, the government reaction function is defined by:

$$ps_t = ps^* + \lambda_t \left(d_{t-1} - d^*\right) \tag{6}$$

where the primary surplus ratio has two components: the primary surplus ratio associated with target debt ratio and the policy response to the gap between the observed debt ratio and the target debt ratio. The parameter $\lambda_t$ indicates the intensity of the policy response at time $t$, given the debt ratio gap in the previous period. Equation (6) characterises a fiscal rule or a policy reaction function.

Combining equations (3), (5) and (6), the public debt as a proportion of GDP including the policy reaction parameter $\lambda_t$ can be obtained:

$$d_t = \left(\beta_t - \lambda_t\right) d_{t-1} - \left(\beta^* - \lambda_t - 1\right) d^* \tag{7}$$

In order to derive a simple expression for the index of fiscal sustainability, it is assumed that the debt ratio at time $t-1$ is higher than the long-term objective for that ratio $\left(d_{t-1} > d^*\right)$. Hence equation (7) states that $d_t$ would converge to $d^*$, if and only if $\left|\beta_t - \lambda_t\right| < 1$. Therefore, we can use $\left(\beta_t - \lambda_t\right)$ as an indicator of fiscal sustainability. An alternative expression for the Fiscal Sustainability Indicator (FSI) is accordingly:

$$FSI_t = \left(\beta_t - \lambda_t\right) = \left(\frac{1 + r_t}{1 + g_t} - \frac{ps_t - ps^*}{d_{t-1} - d^*}\right) \tag{8}$$

This expression states that a persistently higher spread between the observed real interest rate and the observed growth rate of real GDP would, other thing being equal, lead to higher public indebtedness (high parameter $\beta_t$)[9]. The second parameter $\left(\lambda_t\right)$, measures the ratio between the deviation of observed and target values of the primary surplus and public debt ratios. In addition, a fiscal position would be sustainable if $FSI_t < 1$. In contrast, if $FSI_t \geq 1$ then the fiscal position is unsustainable.

## 4. Data description and empirical results

The empirical analysis of this paper is implemented using quarterly frequencies and covers the period from the first quarter of 1990 to the fourth quarter of 2004. Data was obtained from the World Bank's Global Development Finance (GDF), the IMF's Government Finance Statistics (GFS), the CD-ROM version of the IMF's International Financial Statistics (IFS), and the respective Ministry of Finance websites. As the Czech Republic was founded in 1993, earlier data for this country were not available. Similarly, the data for Panama were not available before 1997.

To construct a Fiscal Sustainability Indicator (FSI), following Croce and Juan-Ramón (2003), we use $d^*$ equal to the lowest value reached by the debt ratio during the period under study. The value of $\beta^*$ represents the median of the distribution of the observed values of $\beta$ for the group of countries. Its value was set at 1.026. This implies that the expected value of the real interest rate is 2.6 percentage points higher than the real growth rate, in a steady state. Typically, the rate of interest tends to be higher than the rate of growth. In that case, a country that starts with any debt at all must hold its structural primary balance at a small surplus in order achieve sustainability. When countries rise their debt levels, they increase their exposure to higher interest rates. A rise in interest rates without an equal increase in the output growth rate will further undermine fiscal sustainability.

Table 1 shows the countries with problems of fiscal sustainability during 1990Q1-2004Q4. Countries for which the FSI was above the threshold of 1 at least 75% of the time were classified as having been fiscally unsustainable $(\beta - \lambda > 1)$ during the period considered. Also, Table 1 shows the frequency of $\beta$ values being higher than $\beta^*$, and the frequency of $\lambda$ assuming a negative value (implying primary deficit). In general, the selected countries in the sample present an unsustainable fiscal stance explained mostly by government fiscal deficits rather than spreads between the real interest rates and the growth rates. In the same way, Figure 1 shows debt to output ratios for each of the 18 developing countries, while Figure 2 presents the results of the FSI for each developing country, arranged alphabetically to facilitate the discussion. As shown in Figure 2, the higher FSI reflect fiscal unsustainability.

According to the FSI, Argentina shows an unsustainable fiscal position in 87% of the period studied, explained by continuous primary fiscal deficit $(\lambda < 1)$. Also, the public sector debt to GDP ratio grew from about 40% in early 1992 to about 125% in the last quarter of 2004 (see Figure 1). Similarly, Brazil shows an unsustainable fiscal stance in about 62% of the period considered (see Table 1).

Inadequate primary fiscal balances and relatively high spreads between the real interest rate and the growth rate contribute to this unsustainability. The public debt to GDP ratio of Brazil decreased in the first half of the 1990s (from about 350% in 1993 to about 43% in 1995) and increased continuously, reaching about 85% towards the end of 2004. On the contrary, for Chile, the FSI fluctuated above the threshold of 1 from 1999 to 2003 (see Figure 2), explained mainly by primary fiscal deficit. Specifically, the results show the impact on the Chilean economy of the Brazilian crisis in January 1999 (Samba effect). However, the public debt to GDP ratio decreased from about 45% in 1990 to about 10% in 2004 (see Figure 1).

**Table 1.** *Analysis of Fiscal Sustainability Indicators*

| Country | Frequency | | |
|---|---|---|---|
| | $\beta - \lambda > 1$ | $\beta > \beta^*$ | $\lambda < 0$ |
| Argentina | 87% | 42% | 95% |
| Brazil | 62% | 42% | 60% |
| Chile | 33% | 3% | 33% |
| Colombia | 93% | 37% | 100% |
| Costa Rica | 100% | 2% | 100% |
| Czech Republic | 95% | 20% | 84% |
| Dominican Republic | 40% | 20% | 40% |
| El Salvador | 97% | 3% | 100% |
| Honduras | 98% | 13% | 100% |
| Hungary | 95% | 30% | 97% |
| Indonesia | 50% | 2% | 60% |
| Malaysia | 47% | 7% | 77% |
| Mexico | 83% | 18% | 85% |
| Panama | 84% | 0% | 97% |
| Peru | 80% | 42% | 93% |
| Philippines | 98% | 10% | 100% |
| Thailand | 38% | 13% | 38% |
| Turkey | 100% | 50% | 100% |
| All Countries | 76% | 20% | 81% |

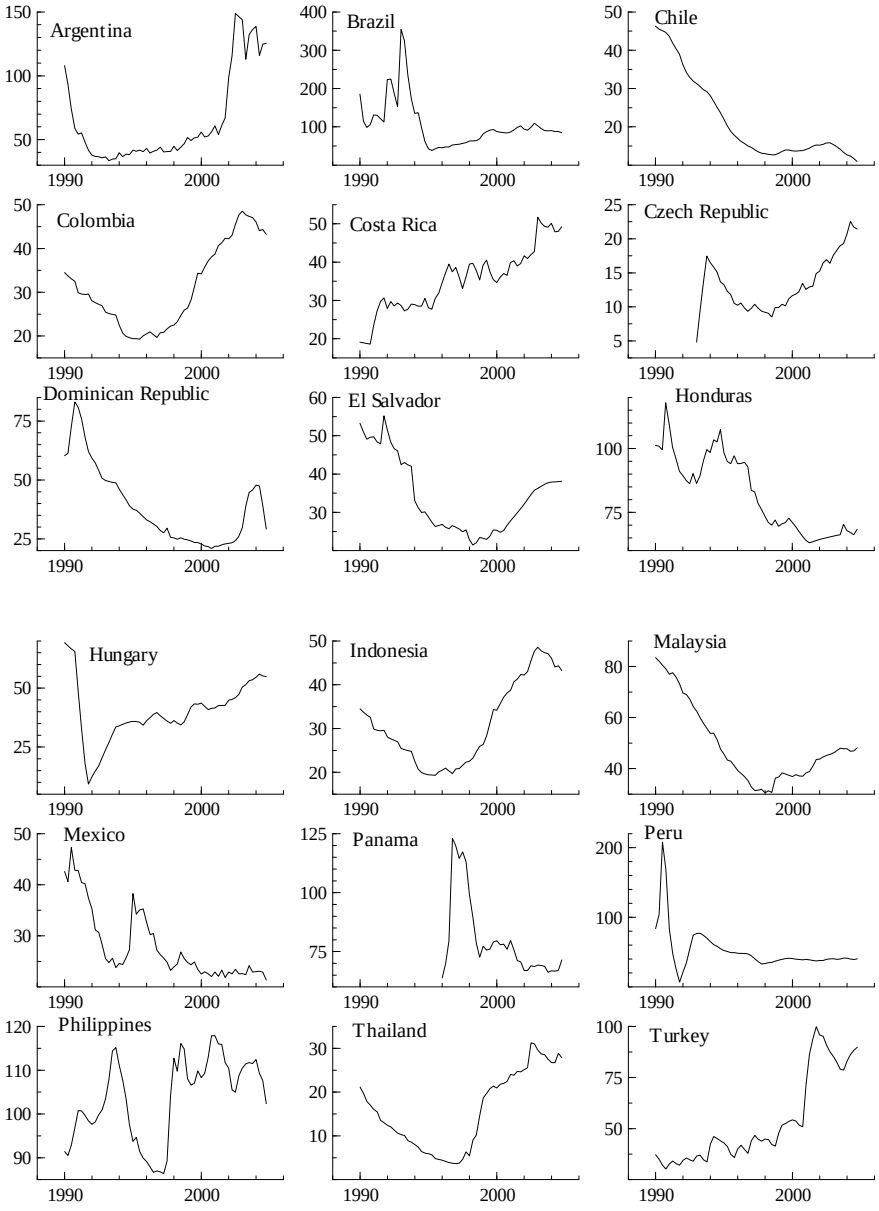
**Source:** Author's calculations.

**Note:** Number of quarters as a percentage of total quarters.

The FSI for Colombia, Costa Rica and the Czech Republic has consistently maintained an unsustainable fiscal position as a result of primary fiscal deficit and higher real interest rate-growth gap, respectively. The public debt to GDP ratio has increased in the three countries, especially since 1998. While in the Dominican Republic the FSI fluctuated above the threshold of 1 during the period 1990-1991, in 1994, in two quarters of 1996, during the period 1999-2000 and from the third quarter of 2002 to the first half of 2004. Consistent with this, the Dominican Republic showed primary fiscal deficit and a deep gap between real interest rates and growth rates in the same period. From 1990 to 2000, the debt to GDP ratio decreased (from approximately 80% to approximately 20%) to increase thereafter reaching about 30% in the last quarter of 2004 (see Figure 1).

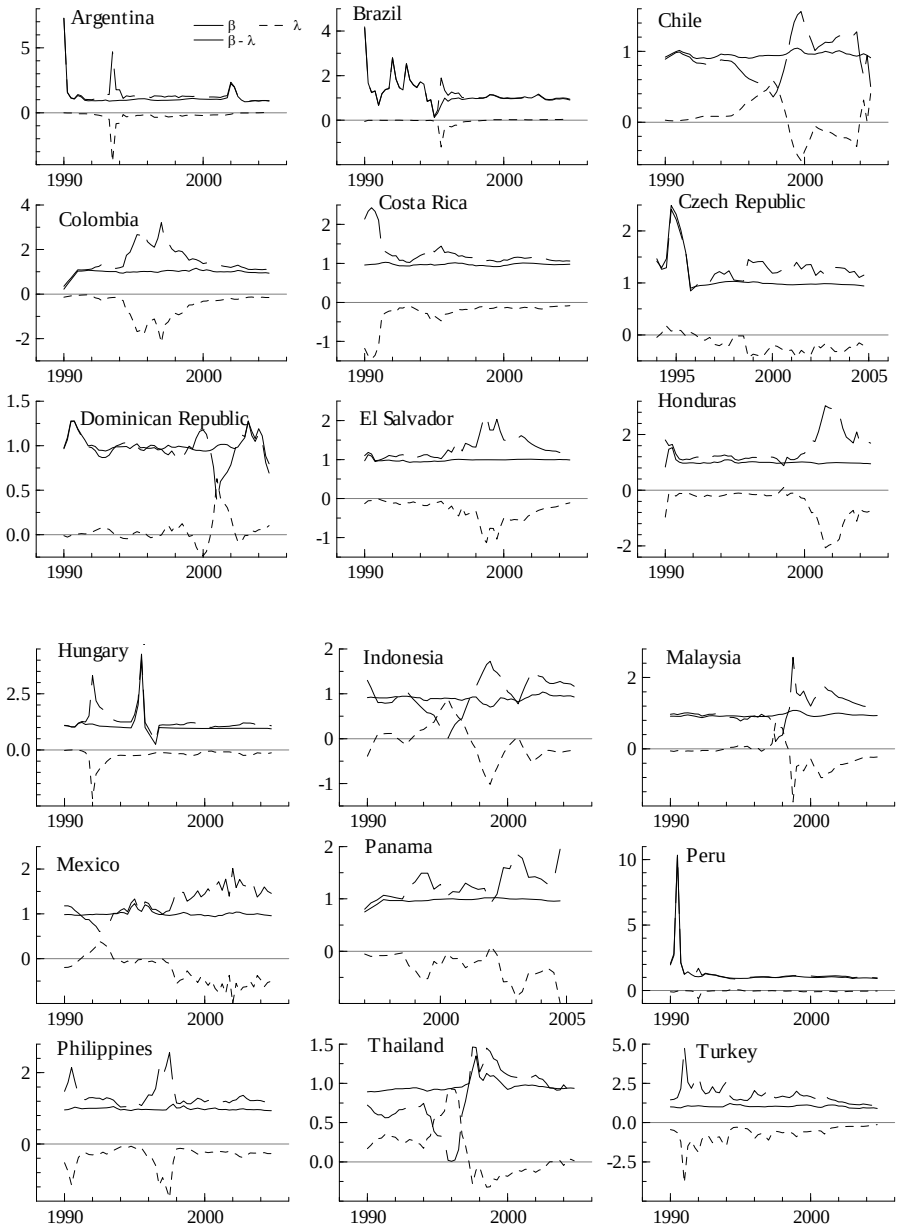
For El Salvador, Honduras and Hungary the FSI persistently presented an unsustainable fiscal stance, explained fundamentally by the primary government deficit. The public debt to GDP ratio decreased in Honduras, but increased in El Salvador and Hungary.

**Figure 1.** *Debt to GDP*




**Source:** Author's calculations.

**Figure 2.** *Fiscal Sustainability Indicators*




**Source:** Author's calculations.

According to the FSI Indonesia shows a sustainable fiscal position during the final quarter of 1990 until the middle of 1991 and from 1993 to the second quarter of 1997. From the third quarter of 1997, the FSI jumped to an unsustainable area $(\beta - \lambda > 1)$ and remained in this area until early 2000, as a consequence of the October 1997 crisis. However, the FSI decreased thereafter, crossing into the sustainable area in the short period between 2000Q2-2001Q1. After this period, the FSI returned to an unsustainable area (see Figure 2). Between 1990 and 1996, the public debt to GDP ratio decreased (from about 35% to about 20%) but it increased abruptly from 1997 (about 45% in 2004). The results for Malaysia show a consistently sustainable fiscal balance in the period 1990-1997 (with two exceptions, the first two quarters of 1991), but the Fiscal Sustainability Indicator fluctuated intensively above the threshold of 1 from the second part of 1998 to 2004. The debt to GDP ratio decreased from 1990 (about 80%) to 1997 (about 30%), but shows a gradual increase from 1998.

The FSI for Mexico remained below 1 from 1991 to the first part of 1993, but from their third quarter of 1993 and the end of the 1994 crisis the Fiscal Sustainability Indicator moved into the unsustainable area and remained there until 2004. Mexico's public debt to GDP ratio decreased from 1990 (about 47%) to 1994 (about 25%) but increased to about 38% in 1995 and then decreased to about 21% in 2004. In most of the years under study, the FSI for Panama presents an unsustainable fiscal position (84% of the time), and the public debt to GDP ratio has fluctuated to around 70%. On the other hand, the Fiscal Sustainability Indicator for Peru shows an unsustainable fiscal stance during the period 1990-1993 and from the last quarter of 1995 to the first quarter of 2004. The public debt to GDP ratio decreased from about 200% in 1990 to about 40% in 2004 (see Figure 1). For the Philippines, the FSI exhibits an unsustainable fiscal position during 98% of the period considered, defined principally by primary fiscal deficit, while the public debt to GDP grew from about 90% to about 102% between 1990 and 2004.

The FSI for Thailand indicated sustainability until the crisis in 1997, when it moved to above 1. This is basically explained by a primary fiscal deficit and high spreads between the real interest rate and the growth rate. In 2003, the FSI returned into the sustainable area. The public debt to GDP ratio decreased from about 21% in 1990 to about 3.8% in 1996. However, from 1997 it grew to about 27% in 2004. The results of the FSI for Turkey showed an unsustainable fiscal position overall in the period studied, and the debt to GDP ratio increased from about 30% to about 90% during 1990 and 2004.

In summary, Argentina, Colombia, Costa Rica, the Czech Republic, El Salvador, Honduras, Hungary, Mexico, Panama, Peru, the Philippines and Turkey present large unsustainable fiscal positions in most of the period studied, which is explained basically by primary fiscal deficits.

## 5. Concluding remarks

In this paper a Fiscal Sustainability Indicator has been constructed for 18 developing and emerging countries and classified the countries for which the FSI was above the threshold of 1 at least 75% of the time as having been fiscally unsustainable. 12 countries were identified as presenting large unsustainable fiscal positions in most of the period studied, explained basically by primary fiscal deficits. Interestingly, Panama presents an unsustainable fiscal position in 84% of the time, and a high public debt to GDP ratio. These results suggest that there is no evidence that officially dollarized countries have run more prudent fiscal policies than non-officially dollarized developing countries. Panama has relied heavily on the IMF over the past 35 years or so, with 17 IMF programmes since 1973 (see Edwards, 2001).

For future research, it would be interesting to apply the same analysis to a larger sample of countries and to a higher frequency of data, such as monthly data, as well as the refinement of the FSI to include behavioural content that would take into account endogenous private savings and investment behaviour, thereby allowing extensions to externally financed public deficits. On the other hand, one must investigate whether those fiscal imbalances in selected emerging and developing countries reflect deeper structural shortcomings such as soft budget constraints and inefficient tax systems.

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## Notes

(1) Government solvency is a necessary but not sufficient condition for fiscal policies to be sustainable because of the necessary assumptions concerning private savings and investment behaviour (Horne, 1991).

(2) For comprehensive surveys of fiscal sustainability, see Chalk and Hemming (2000); IMF (2002) and IMF (2003).

(3) Burnside (2004) and Díaz Alvarado et al. (2004) survey literature on fiscal sustainability with special focus on emerging market countries. Mora (2004) applies and analyses three methodologies to assess the fiscal sustainability of the central government's debt. Perotti (2007) presents a survey on fiscal policy in developing countries from the point of view of long-run growth. Tanner (2013) critically reviews recent work regarding the sustainability of public debt.

(4) The excessive liability of "dollarization" in the domestic banking sector is a key determinant of sudden stops.

(5) A drawback of this model is how to define normal conditions for developing countries.

(6) See Mendoza and Oviedo (2009) for a variant of the framework proposed by Mendoza and Oviedo (2006), and an application for Brazil, Colombia, Costa Rica and Mexico.

(7) $\beta^* > 1$ implies $r > \beta$ , and indicates that in steady states there is an efficient capital overaccumulation (see Barro, 1976).

(8) For a detailed demonstration see Croce and Juan-Ramón (2003).

(9) For mature stable economies the expected value of $\beta$ should be about 1, higher than 1 for economies with relative scarce capital and high financial intermediation costs, and much higher than 1 and more volatile in contexts of economic and political uncertainty.

## References


Barnhill, T.M. and Kopits, G. (2004). Assessing fiscal sustainability under uncertainty. *The Journal of Risk*, 6(4):31-53

Barro, R.J. (1976). Reply to Feldstein and Buchanan. *Journal of Political Economy*, 84(2):343-349

Belhocine, N. and Dell'Erba, S. (2013). The impact of debt sustainability and the level of debt on Emerging Markets spreads. Working Paper WP/13/93, International Monetary Fund

Blanchard, O.J. (1990). Suggestions for new set of fiscal indicators. Working Paper 79, OEDC

Blanchard, O.J., Chouraqui, J.-C., Hagemann, R.P., and Sartor, N. (1990). The sustainability of fiscal policy: New answers to an old question. *OCDE Economic Studies*, (15):7-35

Budina, N. and van Wijnbergen, S. (2009). Quantitative approaches to fiscal sustainability analysis: A case study of Turkey since the crisis of 2001. *World Bank Economic Review*, 23(1):119-140

Buiter, W.H. (1985). Guide to public sector debt and deficits. *Economy Policy*, 1(1):13-79

Burnside, C. (2004). Assessing new sustainability analysis. Mimeo, World Bank

Calvo, G.A., Izquierdo, A., y Talvi, E. (2003). Sudden stops, the real exchange rate and fiscal sustainability: Argentina's lessons. Working Paper 9828, National Bureau of Economic Research

Celasun, O., Debrun, X. and Ostry, J.D. (2007). Primary Surplus Behavior and risks to Fiscal Sustainability in Emerging Market countries: A "Fan-Chart" approach. *IMF Staff Papers*, 53(3):401-425

Chalk, N. and Hemming, R. (2000). Assessing fiscal sustainability in theory and practice. Working Paper WP/00/81, International Monetary Fund

Croce, E. and Juan-Ramón, V.H. (2003). Assessing fiscal sustainability: A cross-country comparison. Working Paper WP/03/145, International Monetary Fund

Díaz Alvarado, C., Izquierdo, A., and Panizza, U. (2004). Fiscal sustainability in Emerging Market countries with an application to Ecuador. Working Paper 511, Inter-American Development Bank

Edwards, S. (2001). Dollarization myths and realities. *Journal of Policy Modeling*, 23(2):249-265

Frank, N. and Ley, N. (2009). On the probabilistic approach to fiscal sustainability: Structural breaks and non-normality. *IMF Staff Papers*, 56(4):742-757

Galindo, A. and Izquierdo, A. (2003). Sudden stops and Exchange rate strategies in Latin America. Working Paper 484, Inter-American Development Bank

Ghosh, A.R., Kim, J.I., Mendoza, E., Ostry, J.D. and Qureshi, M.S. (2013). Fiscal fatigue, space and debt sustainability in advanced economies. *The Economic Journal*, 123(566):F4-F30

Greenlaw, D.; Hamilton, J.D.; Hooper, P. and Mishkin, F.S. (2013). Cruch time: Fiscal crises and the role of monetary policy. Working Paper 19297. National Bureau of Economic Research

Hamilton, J.D. and Flavin, M.A. (1986). On the limitations of government borrowing: A framework for empirical testing. *American Economic Review*, 76(4):809-819

Horne, J. (1991). Indicators of fiscal sustainability. Working Paper WP/91/5, International Monetary Fund

Hostland, D. and Karam, P. (2005). Assessing debt sustainability in Emerging Market economies using stochastic simulation methods. Working Paper WP/05/226, International Monetary Fund

Mendoza, E.G. and Oviedo, P.M. (2006). Fiscal policy and macroeconomic uncertainty in developing countries: The tale of the tormented insurer. Working Paper 12586, National Bureau of Economic Research

Mendoza, E.G. and Oviedo, P.M. (2009). Public debt, fiscal solvency and macroeconomic uncertainty in Latin America: The cases of Brazil, Colombia, Costa Rica and Mexico. *Economía Mexicana: Nueva Época*, XVIII(2):133-173

Mora, H. (2004). Assessing fiscal sustainability with alternative methodologies. *Ensayos sobre Política Económica*, 46(I):82-45

Perotti, R. (2007). Fiscal policy in Developing Countries: A framework and some questions. Policy Research Working Paper 4365, The Work Bank

Reinhart, C. Savastano, M. and Rogoff, K.S. (2003). Debt intolerance. *Brooking Papers on Economic Activity*, 2003(1):1-62

Talvi, E. and Végh, C.A. (2000). La sostenibilidad de la política fiscal: Un marco básico. In Talvi, E. and Végh, C.A., editors, *¿Cómo armar el rompecabezas fiscal?*, pages 1-25. Banco Interamericano de Desarrollo, Washington, DC

Tanner, E. (2013). Fiscal sustainability: A 21st century guide for the perplexed. Working Paper WP/13/89, International Monetary Fund

Xu, D. and Ghezzi, P. (2002). From fundamentals to spreads: A fair spread model for high yield Emerging Markets sovereigns. Mimeo, Deutsche Bank

IMF (2002). Assessing sustainability. Mimeo, Policy Development and Review Department, International Monetary Fund

IMF (2003). Sustainability assessments-review of application and methodological refinements. Mimeo, Policy Development and Review Department, International Monetary Fund

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# Some insights about determinants of economic growth in Romania. An empirical exercise

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**Abstract.** *This paper seeks to identify some determinants of the economic growth in Romania using a Cobb-Douglas production function. We introduce in the standard Cobb-Douglas production function innovation and education. Besides classical factors, such as labor and capital, we add R&D output and human capital variables. We depict significance in the case of classical factors, labor and capital. Patents are found to be negative and significant while human capital is insignificant. These results mean that there is a need to correct for some deficiencies in obtaining patents and to stimulate the development of new own technology and high quality of human capital formation.*

**Keywords:** Cobb Douglas, regression, economic growth, innovation, education.

**JEL Classification:** E00, E23, E25.
**REL Classification:** 8E.

## 1. Introduction

Nations consider economic growth as an important economic and political objective, being the most important factor for their economic success in the long run (Samuelson and Nordhaus 2001, p. 632). Although every country has this objective, in the world there are many disparities in terms of prosperity. In this context, an important question is raised regarding the factors that enhance the economic growth. The identification of these factors would permit the improvement of the welfare in different countries. Having this in mind, we will focus in this paper on analyzing the impact of some determinants of economic growth, using a Cobb-Douglas production function. We are aware of the criticism that the Cobb-Douglas production function has received due to aggregation of the data when macroeconomic level is considered. However, this function is often used in macroeconomics studies.

In the literature, we find that, when referring to Solow (1956) growth model, some authors express the fact that the functional relation between production, capital and labor is an empirical law since it can be "empirically refuted" (Wan, 1971). Following this idea, we proceed to an empirical exercise to estimate the elasticities of output with respect to capital and labor. Our analysis is important due to the importance of attaining a sustainable economic growth in our country. Over time, to these factors, there were added other factors that count for economic growth. Neoclassical theory became insufficient as it explained economic growth through factors' accumulation and exogenous technical change, without focusing upon the causes (Wennekers and Thurik 1999, p. 27). The new theory of economic growth (endogenous growth theory) added new factors for explaining economic growth such as human capital and innovation. The promoters of this new theory implied that the neoclassical model with the production function, with the logic of rational choice and perfect information, do not allow for an active entrepreneur. But innovations and entrepreneurship represents the heart of the national competitiveness (Porter 1990, p. 125 apud Wennekers and Thurik 1999, p. 43). The technical progress left as a residual in the Solow (1956) model of economic growth is explained through the endogenous growth theory. Increasing returns to scale, research and development activity and imperfect competition, human capital and governmental policies are intended to explain the technical progress (Havrylyshyn et al., 1999, p. 2). The endogenous theory implies that the increase of productivity from the developed countries is due to the intellectual achievements and new flows of ideas (Lucas, 2008, p. 1). In his work, Lucas (2008) raises the question if economic growth is generated by the work of genius, scientists which create patents or it can result from other sources too? Thus the new endogenous growth theory comes into place, the explanation being valid: each person earns due to the knowledge of people around him while his idea also

stimulates other people too (Jones, 2005 apud Lucas 2008, p. 2). Thus a positive externality is produced.

Levin, Klevorick, Nelson and Winter (1987) state that a patent offers monopoly of an invention for a limited period as a price for a public recognition that patent assures. When the patent expires, it offers a high diffusion of the benefits. The authors state that, often, the right offered by a patent is broken through competition, by creative methods under the law and thus, the diffusion of the benefits is not always visible. The authors consider that the policy of the patents is efficient in some industries (such as pharmaceutical) but inefficient in other industries. In another study, Hu and Png (2012) mention that, although the objective of the property rights is that of stimulating innovation and economic growth, this is not always attained in practice. One of the reasons suggested by these authors is that because of the restriction imposed of the legislation in order to protect innovation, diffusion is not produced anymore and implicitly economic growth is not generated.

Therefore, innovation is an essential factor of economic growth, which helps producers to satisfy diversified demands of consumers in a context with high competition. This helps the companies to maintain their competitive advantage (Prodan, 2005, p. 5). Same author found a positive relation between the research and development expenditures (independent variable) and patents (dependent variable). His result is in line with the theory that patents are results of precedent investments in research and development (Grossman and Helpman 1990, p. 3). Felix (2008) also finds a positive relation between number of patents and personnel in the field of research and development. The author does an analysis for European Union countries in the period 2000-2005. The same study draws the attention upon the fact that not all the inventions lead to applications for patents. There exist also other modalities to protect the intellectual property for authors' rights, brands. Wennekers and Thurik (1999) which estimate an unrestricted VAR model for the countries of G7 find a long-run relationship between the growth rate of patents and the growth rate of the economy. In the short run there is obtained a negative coefficient for patents. A negative coefficient is also found in a study realised in Malaysia by Gee, Ida and Alavi, published by the International Organisation of Intellectual Property rights. Although the trends of GDP per capita and the trend for applications in obtaining patents are similar, the relation depicted is a negative one. More, Saini and Jain (2011) find a negative correlation between the number of applications for patents and the rate of growth for GDP in China, Indonesia and Malaysia during 2000-2009. Their conclusion is that the impact of the patents over the economic growth is lower in economies which are poorer or in those in which industries that are dependent of patents (such as pharmaceutical industry) have a low share. In the same study, it is mentioned that

the developing countries can choose imitation or transfer while they avoid involving in activities that generate innovations. The negative coefficient means that it is necessary to build an efficient institutional environment so as the property rights could function.

An essential role is accorded to human capital as well, considering that if its level is too low, it is possible that growth will not be produced (Romer 1990, p. 73). Romer highlights the fact that the rate of increase of human capital does not necessarily depend on the labor force or population. In his model, human capital is seen as formal education or instruction at the workplace. According to his model, as long as less human capital is allocated towards research, the growth rate will be smaller. Yamarik (2011, p. 195) explains the importance of human capital through the fact that formal education increases the productivity of workers. More, an educated labor force is more capable to create, implement and adopt new technologies, generating thus economic growth (Benhabib and Spiegel 1994, p. 144). As for the level of education, they are different proxies such as: university enrolment (Yamarik, 2011) or highschool level (Mankiw, Romer and Weil, 1992; Holtz-Eakin, 1992). More, the Asian miracle which refers to the increase of productivity is associated more with investments in primary and secondary education rather than in tertiary education (Aghion et al., 2009, p. 3). Barro and Lee (2000, p. 17) also consider that during the secondary cycle of studies there can be acquired important aptitudes. In the literature there are some debates in what concerns the number of schooling as a proxy for human capital. This is due to the fact that the years of schooling do not represent a measure of the abilities of that person, but the time period allocated in order to obtain the aptitudes (Khan 2009, p. 13). It has been reached the conclusion that a quantitative analysis is not sufficient and that this analysis should be completed with a qualitative analysis based on the existing resources in the school's level and the results of tests (Caselli 2004, p. 3). The main problem of a quantitative measure is that it measures input and not output of the schooling years. Same author insists upon the fact that in rich countries, employees spent more years learning and not accumulating practical experience. In the same line, Klenow and Rodriguez-Clare (1997) reach the conclusion that experience is higher in the poorer countries. However, in these countries experience does not generate economic growth because it is orientated upon unproductive sectors.

In our study, we also choose as a proxy for human capital secondary school graduates, due to lack of data on qualitative measures of human capital.

Even if the theoretical literature is obvious in terms of the positive impact that human capital has upon economic growth, some researchers (see Pritchett, 1996) find in their studies a negative and significant coefficient for the human capital.

The explanation lies in the existence of some deficiencies in the education system and also in the allocation of human capital towards unproductive activities. Other studies find negative and insignificant coefficient for human capital (Benhabib and Spiegel, 1994; Temple, 1999 apud Engelbrecht 2001, p. 3).

More recent studies on the determinants of economic growth include in estimations the role of entrepreneurship for economic growth. In a study made for Iran during the period 1968-2009, Rabiei (2011) finds positive the coefficient for entrepreneurs' production and higher than the coefficients for labor, human capital (proxied by the number of students in tertiary education) and for research and development expenditures.

Zaman, Goschin, Partachi and Herteliu (2007) estimate the classical production function for Romania and Moldavia. Their analysis is a cross-section analysis upon a period of 3 years, during 2002-2004. The capital coefficient for Romania is 0.56 and 0.63 while in Moldavia it has a value of 0.66.Labor in Romania lies between 0.3 and 0.5 and in Moldavia it lies between 0.3 and 0.4. Zaman and Goschin (2010) also find positive coefficients for labor and capital for the period 1990-2007 (0.337 for labor and 0.4098 for capital). In their paper, the authors focus on the technological development of the country.

As we could see in this section, main impact factors on economic growth are labor and capital. However, the science evolved in time and there are identified new determinants of economic growth, such as innovation and education. These factors can be considered as economic growth itself (North and Thomas, 1973 apud Wennerkers and Thurik 1999, p. 36). Our intention is to see, based on an empirical exercise, using the Cobb-Douglas production function, if these factors count for the economic growth in Romania alongside the classical ones, i.e. labor and capital. Identifying if these factors enhance or not economic growth helps us to offer some policy recommendations to attain a sustainable economic growth rate.

The paper is organized as it follows: in section 2 we present the methodology and the data, in section 3 we present the results while section 4 concludes.

## 2. Methodology and data

Our study is based upon Cobb-Douglas model. The model in its preliminary version represents one of the estimating methods of the production function and identification of its determinants, capital and labor. This model is preferred due to the simplicity of the function which is linear in a logarithmic form of the variables and due to the small number of parameters involved (see Tintner et al., 1977). The American senator Paul Douglas noticed the fact that the national income

distribution between capital and labor remained constant for a long period of time (Mankiw, 2002, p. 71). Starting from this observation, he asked for help from the mathematician Charles Cobb so as to identify the production function which respects this rule. Thus, the assumptions of such a production function were as below:

$$Capital\ income = MPK \times K = \alpha \times Y \quad (1)$$

$$Labour\ income = MPL \times L = (1 - \alpha) \times Y \quad (2)$$

where,
K – capital;
L – labor;
MPK – marginal productivity of capital;
α – constant which measures the capital income share in total income, with values between 0 and 1;
MPL – marginal productivity of L.

Thus, the production function has the following form:

$$Y = F(K, L) = A \times K^{\alpha} \times L^{\beta} \quad (3)$$

where,
Y – total output;
A – parameter which measures technology productivity;
K – capital;
L – labor;
β – constant which measures the labor income share in total income.

In the neoclassical theory, we have the assumption of constant returns to scale (thus $\beta = (1 - \alpha)$). This hypothesis is frequent in most of the studies (Abraham-Frois 1998, p. 126). The assumption of constant returns to scale means:

$$z \times F(K, L) = (zK)^{\alpha} \times (zL)^{\beta} = z^{\alpha+\beta} \times K^{\alpha} \times L^{\beta}, \text{ where } \alpha + \beta = 1 \quad (4)$$

In our paper, we use an augmented Cobb Douglas production function, in which we add new variables such as patents and human capital. The general form of the function when more factors are included is as it follows:

$$F(x_1, x_2, ..., x_n) = x_1^{\alpha_1} * x_2^{\alpha_2} * ... * x_n^{\alpha_n} \quad (5)$$

where,

$x_1, x_2, ..., x_n$ – independent variables (determinants of economic growth);

$\alpha_1, \alpha_2, ..., \alpha_n$ – elasticity coefficients of output with respect to each variable.

Our data are collected from National Databases (INSSE) over the period 1990-2010. Our variables are: gross domestic product (Y), gross fixed capital formation (FBCF), number of employees (L), number of patents (patents) and number of secondary education graduates (HC). Gross fixed capital formation is used in accordance with Zaman and Goschin (2010).It represents the value of durable goods (tangible and intangible), dedicated to other purposes than military, bought by producing units in the scope of using them at least one year in the production process, and also the value of services found in fixed capital goods. We deflated the data for gross domestic product and gross fixed capital formation using constant prices expressed in the year 1990. Some of the data for some years (i.e. patents, number of secondary graduation educates) were collected manually from the Statistical Yearbooks of Romania due to difficulty in finding them electronically reported. The rough data proved us a decrease in terms of labor force, a decrease in terms of patents while gross fixed capital formation flows generally increased. In what the number of secondary education graduates is concerned, we noticed small variations in the data.

We are aware that the results are affected by the length of the data series and also by the fact that the analyzed period includes also the years in which the financial crisis took part. Our period of analysis starts with the year 1990 because this is the year when Romania started a transition period to the market economy. Thus, our series contains 21 observations. As for the second disadvantage, if we did not include the years of crisis, our time series would have been reduced, fact that is not desirable.

We run our estimations in Eviews 7.0.

Our econometrical model is given below:

$$\ln(GDP) = \beta_1 \ln(fbcf) + \beta_2 \ln(L) + \beta_3 \ln(patents) + \beta_4 \ln(HC) + \varepsilon \qquad (6)$$

where,
GDP – gross domestic product;
fbcf – gross fixed capital formation;
L – number of employees;
patents – number of patents that were given;
HC – number of secondary education graduates;
$\beta_1$, $\beta_2$, $\beta_3$, $\beta_4$ – elasticity coefficients;
$\varepsilon$ – error variable.

Looking at the graphs for each series, our observation is that they are not stationary. To verify the non-stationarity hypothesis we applied Augmented Dickey Fuller test (ADF) to find out the number of unit roots at a level of significance of 5%. Results are reported below:

**Table 1.** *ADF unit root test, 5% significance level*

| Variable | Trend/intercepts | Critical values | t-Statistic | Probability |
|---|---|---|---|---|
| ln_GDP | Trend and Intercept | -3.673616 | -2.658121 | 0.2619 |
| ln_fbcf | Trend and Intercept | -3.875302 | -0.530305 | 0.9623 |
| ln_L | Intercept | -3.029970 | -1.623913 | 0.4516 |
| ln_patents | Trend and Intercept | -3.759743 | -3.204105 | 0.1207 |
| ln_HC | Trend and Intercept | -3.658446 | -2.464484 | 0.3396 |

In the case of each variable, the value of t-statistics is higher than the critical value for a 5% level of significance. Also, the probability is higher than 5% in every case. Results indicate that the series are non-stationary, having unit roots. We have to differentiate them before proceeding further in estimating the regression. We took the first order differences, we applied the ADF over them and we conclude that our series do not have unit roots. The values for t- statistic are less than the critical level for 5% level of significance, while the probability is under 0.05. This confirms the stationarity of the series, which can be used further in estimating our Cobb-Douglas production function.

**Table 2.** *ADF unit root test, 5% significance level, differentiated series*

| Variable | Trend/intercept | Critical value | t-Statistic | Probability |
|---|---|---|---|---|
| d_ln_GDP | None | -1.960171 | -2.301598 | 0.0242 |
| d_ln_fbcf | None | -1.960171 | -3.738841 | 0.0008 |
| d_ln_L | Intercept | -3.175352 | -43.20934 | 0.0001 |
| d_ln_patents | None | -1.960171 | -5.700563 | 0.0000 |
| d_ln_HC | None | -1.960171 | -5.122419 | 0.0000 |

In the next section, we describe the results we obtain when testing the Cobb-Douglas production function on the differentiated series.

## 3. Results

Our econometrical model based on differentiated series is:

$$dlnGDP = \beta_1 dlnfbcf + \beta_2 dlnL + \beta_3 dlnpatents + \beta_4 lnHC \qquad (7)$$

The recommended lag number for patents is one or two years, based on the fact that the positive results generated by an innovation appear in time, after the new idea is implemented in practice (see Prodan, 2005; Josheski and Koteski, 2011). The lag tests indicated as optimum a two-year lag in the case of patents and labor (number of employees) and a five-year lag in the case of graduates, in line with other studies in which same lag numbers are used. For labor, the lag length tests also indicated that a two-year lag should be used in order to obtain significant result for labor itself. In the case of capital, there were no indications that lags should be used in running the estimation.

In what follows, we give the regression results for the differentiated series in Table 3.

**Table 3.** *Estimation results*

| Variable | Coefficient | Probability |
|---|---|---|
| C | 0.018744 | 0.0343 |
| dlnfbcf | 0.493856 | 0.0000 |
| dlnL(-2) | 0.516556 | 0.0136 |
| dlnpatents(-2) | -0.089525 | 0.0148 |
| dlnHC(-5) | -0.064636 | 0.3349 |
| R-squared | 0.939920 | |
| Adjusted R-squared | 0.915888 | |
| Durbin-Watson | 2.025761 | |
| F-statistic | 39.11108 | |
| Probability F-stat | 0.00 | |

In Table 3 we present the detailed results of the regression. As we can see, probabilities are under 5% for gross fixed capital formation, number of employees and number of patents. The only insignificant coefficient is the coefficient for human capital. The value for $R^2$ is 0.93 which says that the dependent variable is explained in a proportion of 93.99% by the explicative variables. Durbin Watson statistic is also close to 2 (2.02) which means that the errors are not correlated.

In order to check for the validity of the estimated regression, there were tested the 3 criteria that need to be satisfied: the lack of correlation of the residuals, the normality of residuals, homoskedasticity of residuals (constant variance). To check for the correlation of residuals we applied Correlogram – Q-statistics. Results are given in Table 4. To verify the lack or the presence of cointegration we have calculated the interval for no significance $[-1,96/T^{1/2}; 1,96/T^{1/2}]$, where T represents the number of observations. All the coefficients of the autocorrelation and partial autocorrelation function are included in the interval: [-0.506; 0.506], which corresponds to the lack of correlation of the errors. Also, the probability of Q-statistics is higher than 5% in most of the cases.

**Table 4.** *Testing correlation of residuals*

| AC | PAC | Q-Stat | Prob |
|---|---|---|---|
| -0.023 | -0.023 | 0.0098 | 0.921 |
| -0.338 | -0.339 | 2.2532 | 0.324 |
| -0.247 | -0.300 | 3.5495 | 0.314 |
| 0.005 | -0.189 | 3.5500 | 0.470 |
| 0.464 | 0.320 | 9.0415 | 0.107 |
| -0.297 | -0.458 | 11.538 | 0.073 |
| -0.198 | -0.016 | 12.782 | 0.078 |
| 0.051 | -0.026 | 12.876 | 0.116 |
| 0.046 | -0.188 | 12.964 | 0.164 |
| 0.131 | -0.216 | 13.833 | 0.181 |
| -0.127 | 0.173 | 14.863 | 0.189 |
| 0.003 | -0.165 | 14.864 | 0.249 |

For testing the variance we used the test ARCH LM which has a null hypothesis homoskedasticity. The probability of the test is 81.55% which leads to the acceptance of the null hypothesis of homoskedasticity. Another aspect we were concerned of is to test normality based on the histogram. In our case, the value of skewness equal with 0.021 which is higher than zero which reflects the existence of a right asymmetry. Also, the value of the kurtosis is 2,911 < 3, which reflects a platikurtic distribution. The coefficients record very close values of those for normal distribution, which is zero for skewness and three for the kurtosis. The value of the Jarque-Bera statistic is 1.02 with a probability higher than 5%, which confirms that the errors are normally distributed(1).

Based on the previous tests, we can say that our regression is correct, so as we can proceed in interpreting our results. If we look at the coefficients, their sum is not 1 as assumed in the standard Cobb-Douglas production function. In our case, the sum is 0.856 which means that in the case of Romania we obtained decreasing returns to scale with respect to both inputs. Our results are similar to studies such as: Knut and Jungmittag (2008); Zaman and Goschin (2010); Rabiei (2011). At an 1% increase of gross fixed capital formation, gross domestic product increases with 0.493% while at an increase with 1% of labor, gross domestic product increases with 0.516% (in a two-year period). Unlike for these two variables, we obtained an inverse relation for the case of the other two variables, patents and the number of secondary education graduates. More, in the case of patents we obtained a negative relation even when lags were considered. Thus, an increase with 1% of the number of patents is associated with a decrease of 0.089% of the gross domestic product.

We try to explain the puzzling result that we have obtained for the Romanian case. In Romania, the institution which records and analyzes the demands from the industrial property field is State Office for Inventions and Brands (Romanian abbreviation OSIM). This has the role to free some protection titles for property in Romania, which offers the proprietors some exclusive rights in this space. If the market that is designated to commercialize products is reduced, a lot of products which present this potential are patented in other countries. In Romania, as a developing country, often technology is imitated from abroad instead of own innovations and new own technologies. Moreover, in recent analysis (see Andronic 2011), it was observed the fact that Romania is avoided as a space for patents because there is not a sufficient developed country for trading the patented products. Thus, even if there are companies which conduct research and development activities, they often patent their products abroad where they intend to sell their product. The efficiency of patenting differs from one country to another. Some Romanian specialists in the field of intellectual property (as Andronic, 2011) show the main problems on the Romanian market: the long

period of time that is necessary to obtain a patent at OSIM, the high costs of the process and a very low developed market for trading the patented product. Thus, even if there are companies, including foreign ones which have research activities in Romania and obtain products that are likely to be patented, they opt often to patent their product on the markets where they intend to trade them. This fact can influence the result of the research, being imposed a high attention regarding the significance of the patent variable in our study.

Our result is in line with results obtained also by other others, such as (Iwaisako and Futagami, 2011). They explain the negative sign of the patents as a result of the protection offered by them. This protection decreases severely the demand for capital, thus the accumulation for capital is discouraged and they have a negative impact on output, which generates a trap for the economic growth of the country. The authors also state that to this result contributes also the open economy, which permits the technology transfer and diminish the capital accumulation due to the high protection measures. These effects are seen also at the level of output.

In what concerns the negative but not significant coefficient for the secondary education graduates, this lead to the conclusion that in the Romanian case, this variable does not influence economic growth. The negative result for human capital is explained by some researchers (Pritchett, 1996), as the consequence of three deficiencies. First refers to the fact that, school does not create human capital. There exists the possibility that school does not contribute to the improvements of aptitudes and implicitly to the increase of productivity. Another explanation offered by Pritchett refers to the fact that marginal productivity of education decreases soon, while the demand for educated labor force stagnate and labor force supply increases. And finally, the third explanation found by the author for justifying the negative sign of the coefficient is that if, human capital is oriented in activities which are not productive, it can even lead to a decrease of economic growth.

Our results suggest that there is a need to improve the actual systems of education and innovation so as these factors can really be used to their true potential and transformed thus into determinants of economic growth. This situation is highlighted in the literature (Olsen apud Havrylyshyn et al., 1999, p. 2), making reference to the fact that many countries are too poor because they do not use their available resources. Also, the same researcher stated that the higher is the waste of resources, the lower developed is the institutional framework and the legal framework of the country in case.

## 4. Conclusions

In this paper we analyzed the impact of the labor and capital factors, but also of innovation and human capital, on the output of Romania. We obtained positive coefficients for capital and labor in a multiple regression analysis. Being aware of the short number of observations and also of the critics that could be raised due to endogeneity issues, it seemed to us worthwhile to comment upon the results of this simple exercise. The positive effect that these factors have upon economic growth and especially the positive impact of capital is, however, threatened by factors such as patents which come in with a puzzling negative sign. As we could guess from this result, in Romania the intellectual property rights' system has some flaws which impede patents to generate economic growth. One of the most important deficiencies from those mentioned in the literature, is, in our opinion, the reduced market for trading patented products. This fact certainly reduces the positive impact that a patent could have for our national economy. More, bureaucracy in obtaining a patent and high associated costs discourage inventors to patent their discoveries inside the country. These facts discourage the process of inventions in general, which explains the tendency to decrease of obtained patents and also the tendency of the developing economies, in this case Romania to borrow technology from abroad instead of encouraging its own innovations. We come close to the well-known hypothesis from the literature that imitation is preferred when it is cheaper than innovation.

In accordance with other similar studies for other countries, we obtained an insignificant result for the impact of human capital on economic growth, even when a five-year lag was considered. The reasons behind this result are many. One of the most obvious one is the proxy itself for human capital. A qualitative measure for human capital would proxy in a much more consistent way with the theory the role that human capital can play in the economic growth process. Given our proxy based on our data availability, however, we highlight the fact that educational system needs to be improved. The skills that are offered to students after graduating schools (in our case, secondary school) must be correlated with the requirements on both, a superior level of schooling or a job market in case of schools of arts and crafts.

In the end of our study, an interesting question comes up. How long it will take for Romania to attain sustainable economic growth paths, based on other factors than capital and labor? Is Romania prepared to improve significantly the system of innovation and education so they can create value and contribute seriously to the increase of the national income?

As a further direction of study, it would be interesting to include in this very simple framework, the Cobb-Douglas production function, a variable that corresponds to the entrepreneurship. Certainly, if the entrepreneurial activities will increase inside the country, this could be correlated with the impact that innovation and education can have on economic growth.

## Note

(1) These diagnosis results as obtained in Eviews 7.0 can be provided upon request.

## References

Abraham-Fois, G. (1998). *Economie politică*, Bucureşti, Editura Humanitas

Aghion, P., Boustan, L., Hoxby, C., and Vandenbussche, J. (2009). „The Causal Impact of Education on Economic Growth: Evidence from US", *Brookings Papers on Economic Activity*

Andronic, A.M. (2011). „Brevete şi mărci made in Romania – există piaţă sau nu?", Wallstreet, [online] 27 october, available at http://www.wall-street.ro/articol/Legal-Business/109757/Brevete-si-marci-made-in-Romania-exista-piata-sau-NU.html [Accessed 9 september 2012]

Barro, R. and Lee, J.W. (2000). "International Data on Educational Attainment Updates and Implications", *NBER Working Papers 7911*

Benhabib, J. and Spiegel, M. (1994). "The Role of Human Capital in Economic Development Evidence from Aggregate Cross-Country Data"*, Journal of Monetary Economics, 34*

Caselli, F. (2004). "Accounting for Cross-Country Income Differences, *NBER Working Paper No. 10828*

Engelbrecht, H. (2001). "The Role of Human Capital in Economic Growth: Some Empirical Evidence on the "Lucas vs. Nelson-Phelps" Controversy", *Massey University, Discussion Paper No. 01.02*

Felix, B. (2008). "Patents and R&D Personnel", *Eurostat Statistics in Focus,* 108

Gee, L., Ida, M. and Alavi, R. (2007). "Impact of the Intellectual Property System on Economic Growth" [pdf], available at: http://www.wipo.int/export/sites/www/about-ip/en/studies/pdf/wipo_ unu_07_ malaysia.pdf [ Accessed 9 september 2012]

Grossman, G. and Helpman, E. (1990). "Trade, Knowledge Spillovers and Growth", *NBER Working Paper No. 3485*

Havrylyshyn, O. et al. (1999). "Growth Experience in Transition Countries", 1990-98, *IMF Occasional Paper No. 184*

Holtz-Eakin, S. (1992). "Solow and the States: Capital Accumulation, Productivity and Economic Growth"*, NBER Working Paper No. 4144*

Hu, A. and Png, I. (2012). "Patent Rights and Economic Growth: Evidence from Cross-Country Panels of Manufacturing Industries", *CELS 2009 4th Annual Conference on Empirical Legal Studies Paper*

Iwaisako, T. and Futagami, K. (2011). "Patent protection, Capital Accumulation and Economic Growth", *Economic Theory,* July

Josheski, D. and Koteski, C. (2011). "The Causal Relationship Between Patent Growth and Growth of GDP with Quarterly Data in the G7 Countries: Cointegration, ARDL and Error Correction Models", *MPRA Paper No. 33153*

Khan, A. (2009). "Accounting for Cross-Country Differences in Income per Capita", *Business Review,* Q1

Klenow, P. and Rodriguez-Claire, A. (1997). "The Neoclassical Revival in Growth Economics: Has it Gone too Far?", *NBER Macroeconomics Annual*

Knut, B., Jungmittang, A. (2008). "The Impact of Patents and Standards on Macroeconomic Growth: a Panel Approach Covering Four Countries and 12 Sectors", *J Prod Anal 29*, pp. 51-60

Levin, R., Klevorick, A., Nelson, R. and Winter S. (1987). "Appropriating the Returns from Industrial Research and Development", *Brookings Papers on Economic Activity,* no. 3

Lucas, R., (2008). "Ideas and Growth", *NBER Working Paper 14133*

Mankiw, G. (2002). *Macroeconomics,* 5th Edition, Worth Publishers

Mankiw, G., Romer, D. and Weil, D. (1992). "A Contribution to the Empirics of Economic Growth, *The Quarterly Journal of Economics,* vol. 107, no. 2

Pritchett, L. (1996). "Where has all the Education Gone?", *Policy Research Working Paper 1581*, The World Bank

Prodan, I. (2005). "Influence of Research and Development Expenditures on Number of Patent Applications: Selected Case Studies in OECD Countries and Central Europe, 1981-2001", *Applied Econometrics and International Development,* AEID vol. 5-4

Rabiei, M. (2011). "An Empirical Research on the Relationship Between Entrepreneurship and Economic Growth", *Australian Journal of Basic and Applied Sciences,* 5(8): 10601065

Romer, P. (1990). Endogenous Technological Change", *The Journal of Political Economy,* vol. 98, no. 5, Part 2

Saini, A. and Jain, S. (2011). "The Impact of Patent Applications Filed on Sustainable Development of Selected Asian Countries", *BVICAM's International Journal of Information Technology*

Samuelson, P. and Nordhaus, W. (2001). *Economie,* Bucureşti, Editura Teora

Solow, R., (1956. A Contribution to the Theory of Economic Growth, *The Quarterly Journal of Economics,* vol. 70, no. 1

Tintner, G., Deutsch, E., Rieder, R. and Rosner P. (1977). "A Production Function for Austria", *De Economist,* 125, no. 1

Wan, H.Y. (1971). *Economic Growth,* New York, Harcourt Brace Jovanovich

Wennekers, S. and Thurik, R. (1999). "Linking Entrepreneurship and Economic Growth", *Small Business Economics* 13, pp. 27-55

Yamarik, S. (2011). "Human Capital and State-Level Economic Growth: What is the Contribution of Schooling?", *Ann Reg Sci,* 47, pp. 195-211

Zaman, G. and Goschin, Z. (2010). "Technical Change as Exogenous or Endogenous Factor in the Production Function Models. Empirical Evidence from Romania", *Romanian Journal of Economic Forecasting -2*

Zaman, G., Goschin, Z., Partachi, I. and Herteliu C. (2007). "The Contribution of Labour and Capital to Romania's and Moldova's Economic Growth", *Journal of Applied Quantitative Methods,* vol. 2, no. 1

Statistical Yearbooks of Romania

www.bnro.ro

www.insse.ro

www.osim.ro

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# Evolution of comovement between commodity futures: does biofuels matter?

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**Abstract.** *In this study, the linkages of commodity futures are investigated for the period 1988:M1-2012:M4. Monthly futures prices for nine commodities are utilized throughout the empirical analyses. As the empirical approach, wavelet analysis is chosen to investigate the comovement of commodity futures. By using wavelet based measure of correlation, the correlation between commodity futures are determined both in time and frequency domain. The results indicate that correlations are low for short, medium and long-run. I also find evidence of a tendency towards an increase in correlations after 2008. This can be the result of the global crisis that has an effect on feedstock costs and energy input prices by putting front a channel through biofuels that links energy and agricultural commodities by increasing the correlation between these commodities after 2008.*

**Keywords:** wavelet analysis, comovement, energy futures, agricultural commodity futures, biofuels.

**JEL Classification:** G15, Q42, E44.
**REL Classification:** 15F.

## 1. Introduction

Energy is not only a primary cost item for firms but it also enters to household heating and transportation expenditures. Food prices can affect firm costs through wages. Food expenditures as a share of total expenditures, particularly in low-income households, are high. It is evident that both energy and agricultural commodity prices are among inflationary factors. As a result of this, policy authorities are required to consider both commodity price movements and comovements. The existence of comovement between the prices in agricultural and energy markets is one of the issues that should be considered in policy making. In a different vein, Runge and Senauer (2007) warn that "biofuels have tied oil and food prices together in ways that could profoundly upset the relationships between food producers, consumers, and nations in the years ahead, with potentially devastating implications for both global poverty and food security." It is evident that the existence of price comovement in commodity markets has important implications for different parties including consumers, producers, investors and policy makers.

As a potential link between energy markets and agricultural commodities, biofuels are receiving increased attention. According to Peñaranda and Micola (2011) there is a plausible economic logic for an oil-food connection through biofuels. Many researchers point out the biofuel industry as a potential channel that affects the linkage (Banse et al., 2008; IHT, 2008; Rajagopal et al., 2007; Ren21, 2007; Campiche et al., 2007; Francisco and Augusto, 2009; Harri et al., 2009; Hertel and Beckman, 2010; Peri and Baldi, 2010; Tyner, 2009; Yu et al., 2006; Peñaranda and Micola, 2011). Even though authors present evidence in favor of the existence of such a link, the evidence is not that much clear-cut.

If we assume that there is such a linkage the three possible sources of correlation between oil and biofuels are interfuel substitution, costs and financialization (Peñaranda and Micola, 2011). Oil and biofuels are often considered substitutes. If interfuel substitution is prevalent, changes in oil prices will affect the demand for biofuels by leading changes in their prices. This in turn will affect the demand and the price of feedstock commodities. Agricultural production includes energy intensive activities such as the use of fertilizers, transportation and agricultural field machinery usage. According to NASS (2011), the total of all energy intensive activities account for a high share of the non-feedstock biofuel production cost. Accordingly, energy price alterations lead to agricultural commodity price changes. In futures markets oil is used as a reference commodity and takes a large part in the calculation of most commodity indexes. Therefore, comovement would influence all index components, regardless they are used in

the manufacturing of biofuels or not. The above three channels between oil and biofuel commodity prices can lead to comovement between energy and agriculture commodity prices.

This study examines the co-movement between the futures prices of oil and several commodities by using a wavelet analysis which enables assessing the contemporaneous co-movement between the futures prices of oil and commodities both in the time and frequency domains.

The remainder of this study is as follows: Section 2 reviews the literature. Section 3 describes the data and methodology, Section 4 provides the empirical findings and Section 5 concludes.

## 2. Literature review

The literature on commodity prices can be separated into three strands. The first strand examines the excess comovement, the second examines the effects of changes in energy prices on world markets and the third examines the effects of crude oil and other energy prices on other commodities.

The idea of excess comovement between commodity prices is introduced by Pindyck and Rotemberg (1990). According to them, the correlation of the prices of the commodities with different fundamentals which cannot be explained by macroeconomic effects is called excess comovement. They argue that, due to herd behavior, prices tend to move together. By herd behavior they mean the bullish or bearish manner of traders on all commodities for no plausible reason. Deb et al. (1996) suggest the use of a GARCH framework due to the prevalence of nonnormality and heteroskedasticity of the commodity price changes. These models find weak evidence of comovement using the same commodities and the same time interval as in Pindyck and Rotemberg (1990). Ai et al. (2006) re-examined comovement between agricultural commodities. By using a structural model they are able to explain a substantial part of the correlation between commodities. However, the structural model in Ai et al. (2006) falls short in explaining the comovement between the prices of the commodities with different fundamentals.

Another strand of the literature examines the direct and indirect effects of changes in energy prices through macroeconomic impacts on world markets. (Gohin and Chantret, 2010; Uri, 1996; Lardic and Mignon, 2008; He et al., 2010). Crude oil markets even seem to affect the stock markets (Ciner, 2001; Ghouri, 2006; Miller and Ratti, 2009; Papapetrou, 2001). Various other studies suggest that crude oil

prices have statistically significant effects on economic activity (Adrangi et al., 2001; Berument et al., 2010; Brown and Yucel, 2001; Costantini and Martini, 2010; Fofana et al., 2009; Hamilton, 2009a; Hamilton, 2009b; Hanabusa, 2009; Hsing, 2007; Huang et al., 1996; Jayaraman and Choong, 2009; Jiao and Ma, 2006; Jones et al., 2004; Odusami, 2010; Oladosu, 2009; Papapetrou, 2001; Rafiq et al., 2009; Reynolds and Kolodziej, 2007; Zagaglia, 2010).

Furthermore, a third strand in the literature includes studies examining the effects of crude oil and other energy prices on commodity futures. Gohin and Chantret (2010) found a significant relationship between world energy and food prices by employing a general equilibrium model. Baffes (2007) suggests that if crude oil prices remain high for a certain time period then the most recent commodity price boom is likely to last much longer than earlier booms, at least for food commodities. However, other commodities are likely to follow diverging paths. Plourde and Watkins (1998) document that that short-term price volatility of various commodities is lower than that of oil.

Reviewing the literature enables reconciling the existence of a possible impact of the crude oil futures prices and the agricultural commodity futures prices bilaterally. This study aims to uncover the direct linkages between crude oil and agricultural commodity futures prices rather than the prices of these commodities. Natalenov et al. (2011) argue that if herd behavior in financial markets can be observed, futures markets should reflect this behavior because this behavior is inherent in speculative instruments.

## 3. Data and methodology

Monthly cocoa, coffee, corn, crude oil, rice, soybean oil, soybean, sugar, and wheat futures prices are used in the analyses. The sample period covers 1988:M1-2012:M4. All data is obtained from Bloomberg Database.

This study investigates the linkages among monthly commodity futures prices. This, to some degree, enables extracting some information about the herding behavior of the futures prices. The analysis is conducted within a wavelet framework. The use of wavelet analysis is rare in economics, but its use in a wide variety of disciplines has been growing rapidly during the last two decades[(1)] (Crowley, 2007).

Rua (2010) states that time domain approaches[(2)] reveal the evolution of the comovement between variables by capturing the time varying features, whereas frequency domain approaches[(3)] reveal the evolution of comovement across

frequencies. Wavelet analysis reconciles both the time domain approach and the frequency domain approach. Eventually this enables assessing the relationship between variables at different frequencies and the evolution of the relationship through time.

The Fourier Transform is the conventional method for studying a signal (time series) in frequency domain. It enables translating a time series into the sum of well-chosen sinusoidal basis functions. Using this method the signal in time domain is transformed into frequency domain. However, this transformation removes the time domain features of the signal which can convey essential information while analyzing a nonstationary time series. For such a signal the time interval in which the spectral components (e.g. transient jumps etc.) occur can be important (Yazgan and Korürek, 1996). In other words, the Fourier transform provides information about how much of each frequency component is in a signal (time series) but it provides no information about when this frequency exists (Rua, 2011). The Short-Term Fourier transform (also known as Gabor or windowed Fourier transform) is introduced as a remedy for this limitation. In this transformation the signal is cut into slices by using a window function (also known as window) with a definite length.(4) After this, the Fourier transformation is applied to each segment. According to Heisenberg's Uncertainty Principle, the frequency at a specific time cannot be exactly known so it is only possible to obtain what spectral components exist at a given time interval (Rua, 2011). This means that some frequency resolution should be sacrificed for a better time resolution. In other words, the frequency resolution and time resolution are related with window width positively and negatively respectively (narrow window width good time resolution, poor frequency resolution and vice a versa). An important limitation of the short-term Fourier Transform is the inflexibility of the window length for different frequency components. The wavelet transform becomes a remedy to solve this problem. The wavelet transform enables us to widen or narrow the window width according to frequency i.e. narrow window for high frequency, wide window for low frequency.

Wavelet, by definition, stands for small waves which begin and die out at different finite points in time. In other words, wavelets are finite length oscillatory small waves and they are best described with elementary functions. The wavelet transform enables decomposition of time series in terms of the elementary functions or namely wavelets(5). Wavelets can either be stretched or squeezed in order to mimic the original series which enables to generate locally approximating variables in time or space. In other words, any series can be built up as a sum of

projections onto wavelets with different scales and time positions (Crowley, 2007).

Wavelets can be distinguished into two main categories, such as father and mother wavelet, according to integration. The father wavelet integrates to one where the mother wavelet integrates to zero. The father wavelet (scaling function) and mother wavelet represent the smooth trend (low-frequency) part and the detailed (high frequency) part respectively (Crowley, 2007). All wavelets can be generated from mother wavelets. A mother wavelet is a wavelet that should satisfy a number of both regularity and admissibility conditions (see Mallat, 1998).

A wavelet with scale, s and time, u is defined as

$$\psi_{s,u}(t) = \frac{1}{\sqrt{s}} \psi_{s,u}\left(\frac{t-u}{s}\right) \tag{1}$$

$\psi_{s,u}(t)$ is a wavelet with scale, s and time, u. $\frac{1}{\sqrt{s}}$ is the normalization factor[6], $\psi$ is a mother wavelet.

There are various shapes of wavelet such as Morlet, Mexican hat, symmlet and daublets. In practice, the most commonly used wavelet is the Morlet wavelet (a kind of mother wavelet). A Morlet wavelet can be defined as

$$\psi(u) = \pi^{-1/4} e^{iw_0 u} - e^{u^2/2} \tag{2}$$

A Morlet wavelet is a complex sine wave within a Gaussian envelope. The number of oscillations of the wavelet within the Gaussian envelope is determined by the parameter $\omega_o$ that represents the central frequency (Bigot et al., 2011). Put differently, it represents the wave number and the number of oscillations that are determined by this parameter.[7]

Let $x_t$ denote a random time series, then a wavelet transform of $x_t$ at scale $s>0$ (dilation parameter) and time $u$ (translation parameter) is defined as (Mallat, 1998).

$$W_x(s,u) = \sum x_t \overline{\psi}_{s,u}(t) \tag{3}$$

where $\overline{\psi}_{s,u}(t)$ is the complex conjugate of $\psi_{s,u}(t)$.

The continuous wavelet transform with respect to $\psi(t)$ can be explicitly written as

$$W_x(s,u) = \int_{-\infty}^{+\infty} x(t)\overline{\psi}_{s,u}(t)dt = \frac{1}{\sqrt{s}} \int_{-\infty}^{+\infty} x(t)\overline{\psi}\left(\frac{t-u}{s}\right)dt \tag{4}$$

Also, the time series $x_t$ can be obtained through the inverse wavelet transform which is defined as follows

$$x(t) = \frac{1}{C_\psi} \int_{-\infty}^{+\infty} \left[ \int_{-\infty}^{+\infty} \frac{1}{\sqrt{s}} \psi \left( \frac{t-u}{s} \right) W_x(s,u) ds \right] \frac{du}{u^2} \tag{5}$$

By using the wavelet transform the wavelet power spectrum of time series $x_t$, which is defined as $|W_x(s,u)|^2$, can be obtained. The wavelet power spectrum can be used to measure the relative contribution to the variance of $x_t$ at each scale and time. Obviously, the integration of the wavelet power spectrum both across scale and time gives the total variance of the series. If the aim is the comparison of two time series, the wavelet power spectrum can be extended to do this. For two random times series, namely $x_t$ and $y_t$, the extended wavelet power spectrum, which is called wavelet cross spectrum (WCS), is defined as $WCS_{xy} = W_x(s,u)\overline{W}_y(s,u)$ where $\overline{W}$ stands for complex conjugate. This measure enables obtaining covariance between the series $x_t$ and $y_t$. In other words, WCS shows the areas where two time series have a high common power (Vacha and Barunik, 2012). WCS in wavelet analysis is analogous to covariance in time series analysis but provides no information about the strength of the relationship because it is not bounded to specific values (not normalized). A remedy for this shortcoming is normalizing the WCS and obtaining wavelet coherency (also known as wavelet squared coherence or WCO) which is similar to normalizing covariance and obtaining correlation coefficient in time series analysis. Putting differently, WCO is a normalized measure of the linear relationship between two time series by the individual power spectra. WCO enables measuring the coherence of two time series as a function of time and scale (frequency). Analogous to Fourier coherence, WCO is defined as

$$WCO_{xy}^2 = \frac{\left|WCS_{xy}(s,u)\right|}{\sqrt{\left|W_x(s,u)\right|^2 \left|W_y(s,u)\right|^2}} \tag{6}$$

$WCO_{xy}^2$ takes values between 0 and 1 depending on the strength of the relationship. In the absence of a relationship between series, $WCO_{xy}^2$ takes the value of zero. If there is an exact linear relationship both measures take the value of 1. Hence, a wavelet coherency value which is close to 1 can be interpreted as evidence for significant time-frequency correlation between series.

It is evident that since WCS is a complex function, $WCO_{xy}^{2}$ has an imaginary part, besides it disregards the phase differences. Considering this fact, Rua (2010) proposed a new measure analogous to the dynamic correlation of Crox et al. (2001). The dynamic correlation is a measure related to squared coherency; similarly, the new measure of Rua (2010) is related to wavelet squared coherency. Rua (2010) proposes the real part of WCS which is normalized by individual spectras of the two time series as the new measure and defined as

$$\rho_{xy} = \frac{\Re(WCS_{xy}(u,s))}{\sqrt{\left|W_x(u,s)\right|^2 \left|W_y(u,s)\right|^2}} \tag{7}$$

where $\Re$ denotes the real part of WCS. According to Rua (2010), $\rho_{xy}$ can be seen as a generalization of the dynamic correlation measure of Croux et al. (2001), and it allows assessing the strength of the contemporaneous comovement over both time and frequency. The value of the wavelet based measure, $\rho_{xy}$, ranges between -1 and 1 in a similar way to the standard correlation coefficient and the dynamic correlation proposed by Croux et al. (2001).

## 4. Empirical results

The results on comovement of all commodity pairs are illustrated in contour plots. For convenience, comovement results for both futures prices and returns are provided. For each contour plot, the vertical axis and horizontal axis show the frequency in terms of years and time respectively. Gray scale represents the topographic features of the surface. The gray scale darkens along with the increase in the height of the surface. In other words, the increase in wavelet based measure corresponds to darkening in the scale. There are ten commodity futures price pairs that consist of cocoa, coffee, corn, crude oil, rice, soybean oil, soybean, sugar and wheat. The pairs are given at the top of each contour plot.

The first set of contour plots in Figure 1 represents the comovement of commodity futures prices. The examination of comovement between oil and agricultural commodity futures prices reveals that, in general, the pairs seem to have low correlation for the whole sample period. However, in the medium-run after around 2008, the correlation between provided pairs tends to increase. The second set of contour plots in Figure 2 illustrates the comovement of commodity futures returns. The evidence on returns is consistent with the one obtained using commodity futures prices.

**Figure 1.** *Comovement of Commodity Futures Prices*

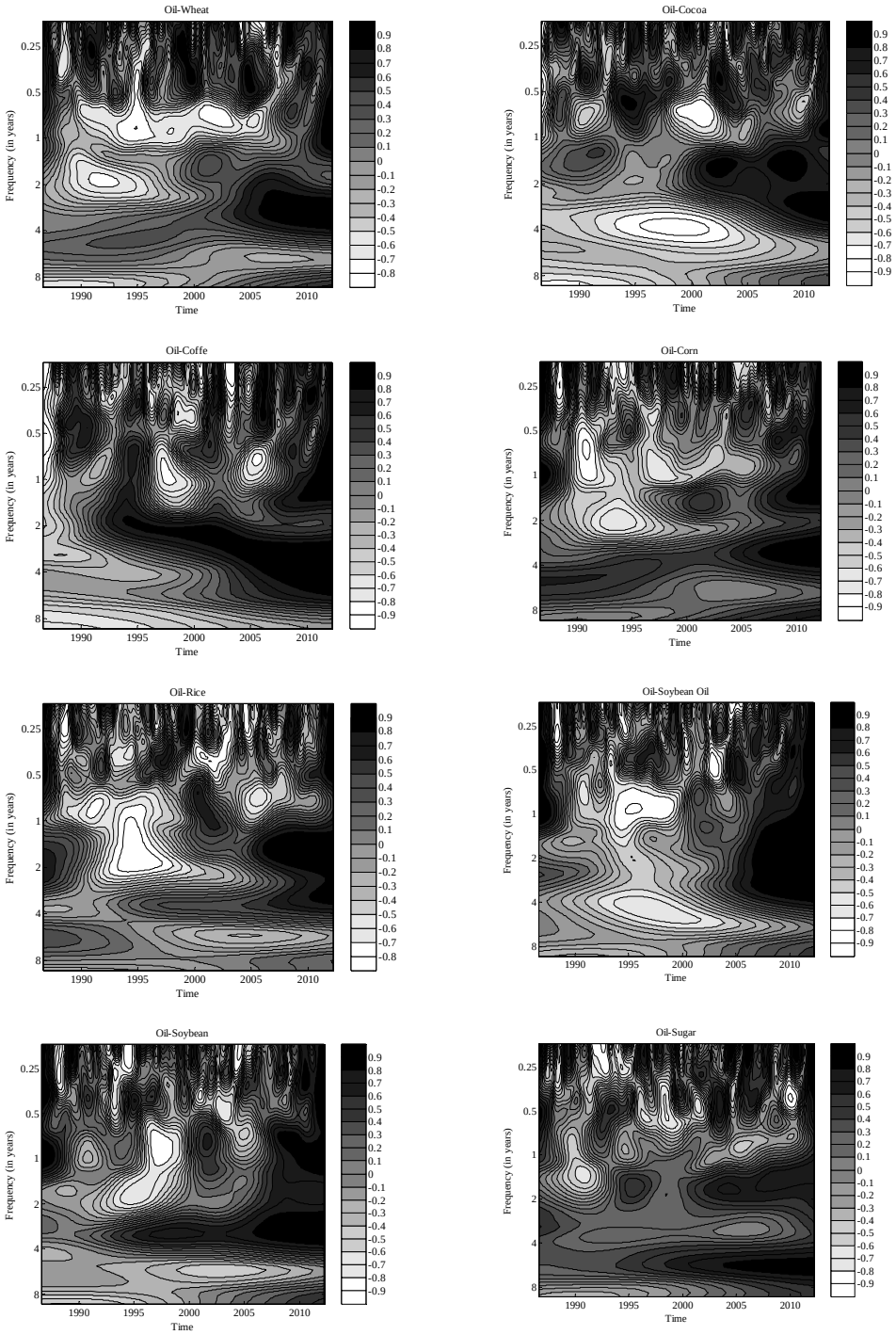
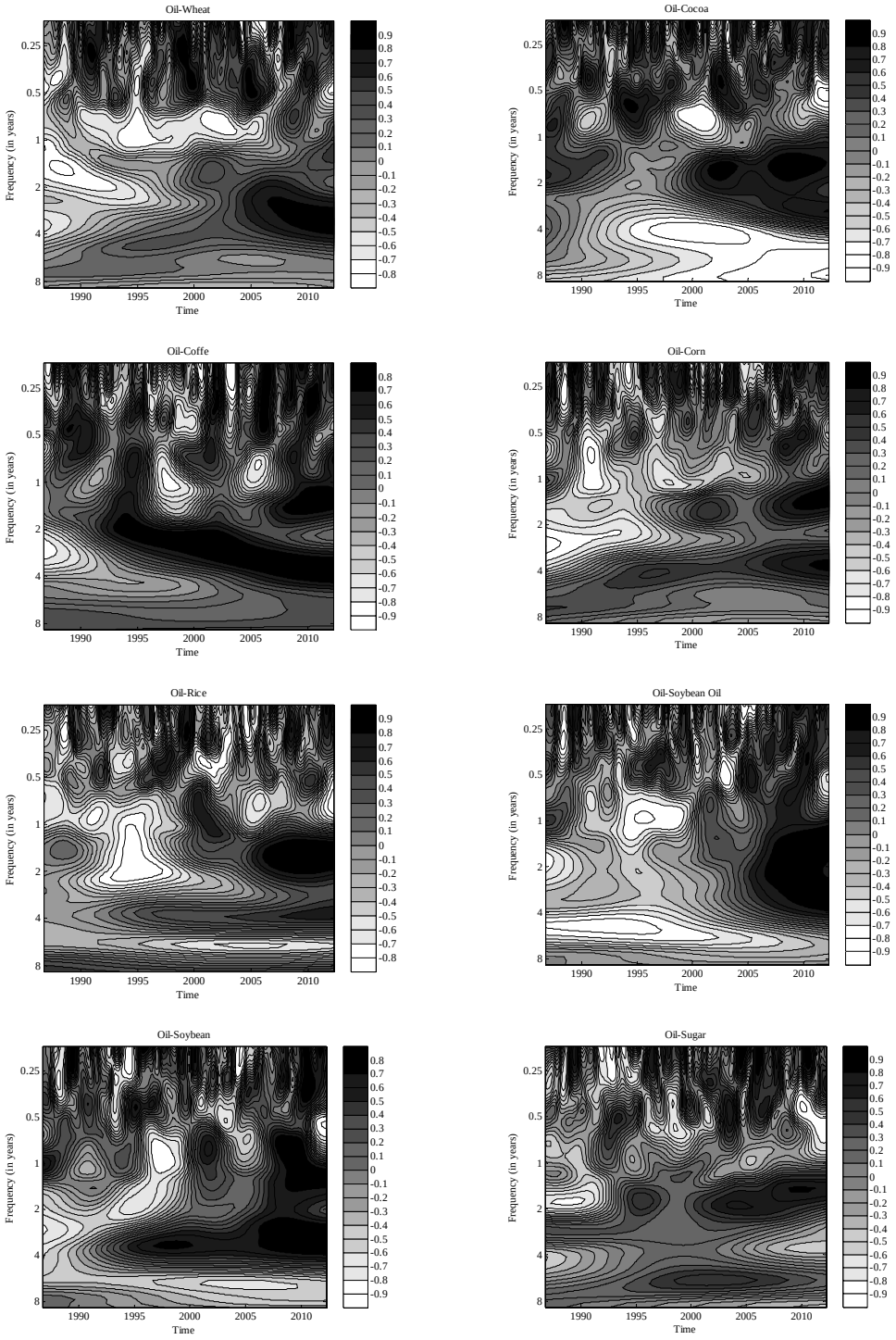


**Figure 2.** *Comovement of Commodity Futures Returns*



## 5. Conclusions

This study investigates oil and agricultural commodity linkages. Monthly commodity futures prices are used cocoa, coffee, corn, crude oil, rice, soybean oil, soybean, sugar, and wheat. Wavelet analysis is employed to investigate the co-movement behavior of commodity futures prices. The wavelet base measure of correlation enables us to study the correlation between commodity futures in both time and frequency domains. The results document that the correlation level is low in the short, medium and long-run. However, it tends to increase after 2008 for the medium-run, particularly for oil-soybean, oil-soybean oil and oil-sugar pairs.

The main production inputs for biofuels are Brazilian sugarcane ethanol, US corn ethanol and soybean oil biodiesel (OECD, 2006). Soybean and corn are feedstock for ethanol production where soybean oil is an input for biodiesel production. Since the biofuel production techniques are standard, feedstock costs, the price of energy inputs, the output prices and the potential to sell byproducts show up as the drivers of biofuels (Peñaranda and Micola, 2011). The 2008 sub-prime mortgage crisis could have affected feedstock costs and the price of energy inputs. This may have revealed a channel through biofuels which links energy and agricultural commodities by increasing the correlation between them after 2008.

### Notes

(1) Cowley (2007) provides a guide and survey for economists.
(2) e.g. Rolling window correlation coefficient.
(3) e.g. Dynamic correlation.
(4) A window function is a function zero-valued outside of some chosen interval. The product of another function or waveform/data-sequence with a window function is also zero-valued outside the interval.
(5) Wavelets correspond to the sines and cosines in the Fourier Transform (Rua, 2011).
(6) The wavelet function at each scale s is normalized to have unit energy in order to ensure that the wavelet transforms at each scale are directly comparable to each other and to the transforms of other time series. (see Torrence and Campo, 1998). In other words the normalization by $1/\sqrt{s}$ equalizes the variance of the scaled mother wavelet and the original one (Rua, 2011).
(7) In practice this parameter is set to 6 (Torrence and Campo, 1998) and (Rua, 2010).

## References


Adrangi, B. et al. (2001). "Chaos in oil prices? Evidence from futures markets", *Energy Economics*, 23, pp. 405-425

Ai, C.R., Chatrath, A., Song, F. (2006). "On the comovement of commodity prices" *American Journal of Agricultural Economics*, 88, pp. 574-588

Baffes, J. (2007). "Oil spills on other commodities", *Resources Policy*, 32, pp. 126-134

Balke, N.S., Fomby, T.B. (1997). "Threshold cointegration", *International Economic Review*, 38, pp. 627-645

Banse, M.H. van Meijl, A. Tabeau, and G. Woltjer (2008). "Will EU biofuel policies affect global agricultural markets?", *European Review of Agricultural Economics*, 35, pp. 117-141.

Berument, M.H., Ceylan, N.B., Dogan, N. (2010). "The impact of oil price shocks on the economic growth of selected MENA countries", *Energy Journal*, 31, pp. 149-176

Bigot, J. et al. (2011). "A new statistical test based on the wavelet cross-spectrum to detect time-frequency dependence between non-stationary signals: Application to the analysis of cortico-muscular interactions, *Neuro Image*, 5, pp. 1504-1518

Brown, S.P.A., Yucel, M.K. (2002). "Energy prices and aggregate economic activity: an interpretative survey", *The Quarterly Review of Economics and Finance*, 42, pp. 193-208

Campiche, J.L. et al. (2007). "Examining the evolving correspondence between petroleum prices and agricultural commodity prices". In: *The American Agricultural Economics Association Annual Meeting*, July 29-August 1, Portland, OR

Ciner, C. (2001). "Energy shocks and financial markets: nonlinear linkages", *Studies in Nonlinear Dynamics and Econometrics*, 5, pp. 203-212

Costantini, V., Martini, C., (2010). "The causality between energy consumption and economic growth: a multi-sectoral analysis using non-stationary cointegrated panel data", *Energy Economics*, 32, pp. 591-603

Croux, C., Forni, M., Reichlin, L. (2001). "A measure of comovement for economic variables: theory and empirics", *Review of Economics and Statistics*, 83, pp. 232-241

Crowley, P.M. (2005). "An Intuitive guide to wavelets for economists", *Bank of Finland Research Discussion Papers*, 1

Crowley, P.M. (2007). "A guide to wavelets for economists", *Journal of Economic Survey*, 12, pp. 207-267

Deb, P., Trivedi, P.K., Varangis, P. (1996). "The excess co-movement of commodity prices reconsidered", *Journal of Applied Econometrics*, 11, pp. 275-291

Fofana, I., Chitiga, M., Mabugu, R. (2009). "Oil prices and the South African economy: a macro-meso-micro analysis", *Energy Policy*, 37, pp. 5509-5518

Francisco, P., Augusto, R.M. (2009). "The Emergence of Biofuels and the Comovement between Crude Oil and Agricultural Prices", Department of Economics and Business, Universitat Pompeu Fabra, available at http://ideas.repec.org/ p/upf/upfgen/1174.html

Ghouri, S.S. (2006). "Assessment of the relationship between oil prices and US oil stocks", *Energy Policy*, 34, pp. 3327-3333

Gohin, A., Chantret, F. (2010). "The long run impact of energy prices on world agricultural markets: the role of macro-economic linkages", *Energy Policy*, 38, pp. 333-339

Hamilton, J.D. (2009a). "Causes and consequences of the oil shock of 2007-08", *Brookings Papers on Economic Activity*, 1, pp. 215-283

Hamilton, J.D. (2009b). "Understanding crude oil prices", *Energy Journal*, 30, pp. 179-206

Hanabusa, K. (2009). "Causality relationship between the price of oil and economic growth in Japan", *Energy Policy*, 37, pp. 1953-1957

Harri, A., Nalley, L., Hudson, D. (2009). "The Relationship between oil, exchange rates, and commodity prices", *Journal of Agricultural and Applied Economics* , 41, pp.

He, Y., Wang, S., Lai, K.K. (2010). "Global economic activity and crude oil prices: a cointegration analysis", *Energy Economics*, 32, pp. 868-876

Hertel, T. , Beckman , J. (2011). "Commodity Price Volatility in the Biofuel Era: An Examination of the Linkage between Energy and Agricultural Markets", *NBER Working Paper*, No. 16824

Hsing, Y. (2007). "Impacts of higher crude oil prices and changing macroeconomic conditions on output growth in Germany", *International Research Journal of Finance and Economics*, 11, pp. 134-140

Huang, R.D., Masulis, R.W., Stoll, H.R. (1996). "Energy shocks and financial markets", *Journal of Futures Markets*, 16, pp. 1-27

Jayaraman, T.K., Choong, C.K. (2009). "Growth and oil price: a study of causal relationships in small Pacific Island countries", *Energy Policy*, 37, pp. 2182-2189

Jiao, F.Y., Ma, J. (2006). "Energy prices and aggregate economic activity: evidence from China", *Proceedings of the 2006 International Conference on Management Science & Engineering*, 1-3, pp. 1917-1922

Jones, D.W., Leiby, P.N., Paik, I.K. (2004). "Oil price shocks and the macroeconomy: What has been learned since 1996", *Energy Journal*, 25, pp. 1-32

Kaiser, G. (1994). *A friendly guide to wavelets*, Boston: Birkhauser

Lardic, S., Mignon, V. (2008). "Oil prices and economic activity: an asymmetric cointegration approach", *Energy Economics*, 30, pp. 847-855

Mallat, S. (1998). *A wavelet tour of signal processing*, New York: Academic press

Miller, J.I., Ratti, R.A. (2009). "Crude oil and stock markets: stability, instability, and bubbles", *Energy Economics*, 31, pp 559-568

Natanelov, V. et al. (2011). "Is there co-movement of agricultural commodities futures prices and crude oil?", *Energy Policy*, 39, pp. 4971-4984

Odusami, B.O. (2010). "To consume or not: How oil prices affect the comovement of consumption and aggregate wealth", *Energy Economics*, 32, pp. 857-867

Oladosu, G. (2009). "Identifying the oil price-macroeconomy relationship: an empirical mode decomposition analysis of US data", *Energy Policy*, 37, pp. 5417-5426

Papapetrou, E. (2001). "Oil price shocks, stock market, economic activity and employment in Greece", *Energy Economics*, 23, pp. 511-532

Peri, M., Baldi, L. (2010). "Vegetable oil market and biofuel policy: an asymmetric cointegration approach", *Energy Economics*, 32, pp. 687-693

Pindyck, R.S., Rotemberg, J.J. (1990). "The excess co-movement of commodity prices", *Economic Journal*, 100, pp. 1173-1189

Plourde, A., Watkins, G.C. (1998). "Crude oil prices between 1985 and 1994: How volatile in relation to other commodities?", *Resource and Energy Economics*, 20, pp. 245-262

Quan, J. (1992). "Two-step testing procedure for price discovery role of futures prices", *Journal of Futures Markets*, 12, pp. 139-149

Rajagopal, D. et al. (2007). "Challenge of biofuel: filling the tank without emptying the stomach?", *Environmental Research Letters*, 2, pp. 1-9

Rau, A. (2010). "Measuring comovement in the time-frequency space", *Journal of Macroeconomics*, 32, pp. 685-691

Reynolds, D.B., Kolodziej, M. (2007). "Institutions and the supply of oil: A case study of Russia", *Energy Policy*, 35, pp. 939-949

Runge, C.F., Senauer, B. (2007). "How biofuels could starve the poor", *Foreign Affairs* , 86, pp. 41-53

Torrence, C., Compo, G.P. (1998). "A practical guide to wavelet analysis", *Bulletin of the American Meteorogical Society*, 79, pp. 61-78

Tyner, W. (2009). "The integration of energy and agricultural markets", Agricultural Economics, 41, Issue Supplement s1, pages 193-201, November 2010

Uri, N.D. (1996). "Changing crude oil price effects on US agricultural employment", *Energy Economics*, 18, pp. 185-202

Yu, T.H.E., Bessler, D.A., Fuller, S. (2006). "Cointegration and Causality Analysis of World Vegetable Oil and Crude Oil Prices", *American Agricultural Economics Association*, July 23-26, Long Beach, CA

Zagaglia, P. (2010). "Macroeconomic factors and oil futures prices: a data-rich model", *Energy Economics*, 32, pp. 409-417

FAO (2006). "Food Outlook: Global Market Analysis", no. 1, available at ftp://ftp.fao.org/docrep/fao/009/j7927e/j7927e00.pdf.

Ren21 (2007). "Renewables 2007: Global Status Report", available at www.ren21.net/pdf/RE2007_Global_Status_Report.pdf

United States Congress (2005). "Energy Policy Act of 2005", Public Law 109-58-August 8, available at http://genomicsgtl.energy.gov/biofuels/legislation.shtml#2005

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# Romanian banking activity spatial distribution between 2009 and 2012

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**Abstract.** *The financial crisis has influenced significantly the Romanian banking system activity causing different changes of Banks strategies between 2009 and 2012 (in 2013 changes are still registered). Within a poor credit market, the Banks market share registered important fluctuations, some of them being forced to close the activity.*
*This paperwork aims to identify the concentration level of Romanian banking market and to analyze the changes registered within crisis period. Furthermore, there are presented the market areas for the main banks within the Romanian banking system and the territorial location of their units.*

**Keywords:** spatial distribution, banking system, nearest neighbor statistics.

**JEL Classification:** E5, R1, R3.
**REL Classification:** 10B, 11C, 16J.

## Introduction

Bank's units spatial distribution within geographical territory shows the accessibility level of banking services to their public. The banks are the main institutions of the financial system of any economy. Even so, there is an incapacity to reach the entire population, therefore this reduces services accessibility.

The main reasons of choosing a certain location for bank branches are known basically only by the top management. Fujita and Krugman (2004) and also O' Sullivan (2007), consider the assumption that the spatial behavior is not random, but a result of many advantages that firms enjoy when they choose a certain location.

This paperwork analysis the main reasons for banks of choosing a certain location within Giurgiu country and the results obtained after applying the Nearest Neighbor Statistics which were interpreted using Kings Scale.

## 1. Romanian banking market context

The spatial distribution of banks in any geographic entity determines the level of accessibility to its services by the public. The analysis purpose was to determine the number of available commercial banks and the respective distances between each other (in this particular case for Giurgiu County).

Banks are the most dominant institution in the financial system of any economy. However, there is a certain inability of banks to reach the entire population, thing that reduced the accessibility of its services.

As for Fujita and Krugman observations, it is reasonable to suppose that the spatial behavior is not coincidental, but rather is due to a number of advantages that firms enjoy when they choose a certain location (usually named economies of agglomeration).

Discussing the location of strategy of banks, Birkin observed that in general, bank location strategy follow the same localization logic as other private services firms. There were find there factors that banks consider in location strategy:

- Access to potential customers;
- Sales banking services;
- Overall bank earnings.

On the Romanian banking market, many changes were registered due to the global crises therefore some of the banks announced their merges or their retreat from the market or the closing of some branches.

In 2009 the economic environment was declining and this affected the banking system as well. Factors that determined this situation were the ones specific to the crisis and affected directly the banks were such as: the growth of unemployment rate and the incertitude on the labor market, the reduction of the population revenues, the diminishing of the investments, etc.

Therefore, the number of foreign banks branches in Romania remained as in 2008 but the number of the local ones was reduced with 1.

Even if the first 5 banks from Romania (considering the assets) were having above the half of the entire banking system assets, they registered a reduction of the share in the total banking system (from 54.3%, in decembre 2008 to 52.4%, in decembre 2009).

In 2010, the crises changes the main objectives of the banks, and they decided, instead of quantitative targets (market share, loans marketing campaigns, maximization of the profits) to be more careful to the risk of credit.

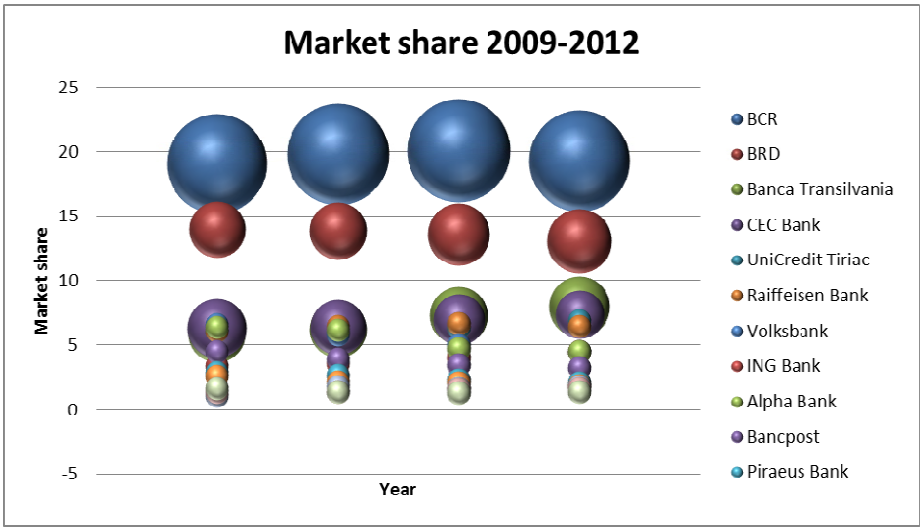
2011 was an interesting year for the structure of the banking system. BCR overtook the activity of Anglo-Romanian Bank, a new shareholder of Volksbank Romania and Marfin Bank, and also a small reduction of the total number of banks acting on the Romanian banking. The changes continued in 2012 with new mergers (especially in cases of Greek banks) and changes of shareholders. Overall, the market share evolution looked like in the next table.

**Table 1.** *Romanian banking market share during 2009-2012*

| Bank | Market share 2009 | Market share 2010 | Market share 2011 | Market share 2012 |
|---|---|---|---|---|
| BCR | 19.1 | 19.8 | 20.1 | 19.3 |
| BRD | 14 | 13.9 | 13.6 | 13.1 |
| Banca Transilvania | 5.9 | 6.2 | 7.3 | 8 |
| CEC Bank | 6.3 | 6.4 | 7 | 7.4 |
| UniCredit Tiriac | 6.1 | 6 | 6.4 | 6.9 |
| Raiffeisen Bank | 6.1 | 6.5 | 6.7 | 6.5 |
| Volksbank | 6.6 | 5.8 | 5 | 4.5 |
| ING Bank | 3.4 | 3.6 | 4.1 | 4.5 |
| Alpha Bank | 6.4 | 6.2 | 4.7 | 4.5 |
| Bancpost | 4.5 | 3.9 | 3.5 | 3.3 |
| Piraeus Bank | 2.9 | 2.7 | 2.3 | 2.1 |
| Banca Romaneasca | 2.6 | 2.2 | 2.1 | 1.9 |
| Garanti Bank | 1.1 | 1.8 | 1.7 | 1.8 |
| citi Bank | 1.4 | 1.4 | 1.6 | 1.7 |
| Credit Europe | 1.7 | 1.4 | 1.3 | 1.4 |

**Source:** www.BNR.ro

**Figure 1.** *Banks market share evolution during 2009-2012*




The situation on the top banks with regards to assets is similar to the market share. During the analyzed period (2009-2012) there is registered a slightly increased of the total assets in case of important banks, with high market share. Even so, no significant change is registered between the most important players on Romanian banking market.

**Table 2.** *Top 15 Banks in Romania in terms of assets*

| Bank | Assets 2009 | Assets 2010 | Assets 2011 | Assets 2012 |
|---|---|---|---|---|
| BCR | 67.3 | 67.6 | 71 | 70.6 |
| BRD | 46.5 | 47.4 | 48 | 47.9 |
| Banca Transilvania | 19.4 | 21.5 | 25.7 | 29.3 |
| CEC Bank | 20.8 | 21.6 | 24.8 | 26.7 |
| UniCredit Tiriac | 20.2 | 20.4 | 22.3 | 24.9 |
| Raiffeisen Bank | 20 | 21.7 | 23.6 | 23.4 |
| Volksbank | 21.7 | 19.7 | 17.7 | 16.5 |
| ING Bank | 10.9 | 12 | 14.5 | 16.5 |
| Alpha Bank | 21.1 | 21.3 | 16.5 | 16.5 |
| Bancpost | 14.5 | 13.4 | 12.2 | 12.1 |
| Piraeus Bank | 9.5 | 9.3 | 8.1 | 7.7 |
| Banca Romaneasca | 8.5 | 7.6 | 7.4 | 7 |
| Garanti Bank | 3.5 | 6 | 6.1 | 6.6 |
| citi Bank | 4.5 | 4.8 | 5.7 | 6.2 |
| Credit Europe | 5.6 | 4.8 | 4.7 | 5.1 |
| Total assets for banking system | **330.2** | **342** | **343.9** | **365.9** |

Considering the above date, it was considered relevant the Herfindahl-Hirschman Index (HHI) that is a measure of the size of firms in relation to the industry and an indicator of the amount of competition among them. Named after economists Orris C. Herfindahl and Albert O. Hirschman, it is an economic concept widely applied in competition law, antitrust and also technology management. It is defined as the sum of the squares of the market shares of the 50 largest firms (or summed over all the firms if there are fewer than 50) within the industry, where the market shares are expressed as fractions. The result is proportional to the average market share, weighted by market share. As such, it can range from 0 to 1.0, moving from a huge number of very small firms to a single monopolistic producer. Increases in the Herfindahl index generally indicate a decrease in competition and an increase of market power, whereas decreases indicate the opposite. The major benefit of the Herfindahl index in relationship to such measures as the concentration ratio is that it gives more weight to larger firms.

**Table 3.** *IHH for Romanian banking system (2009-2012)*

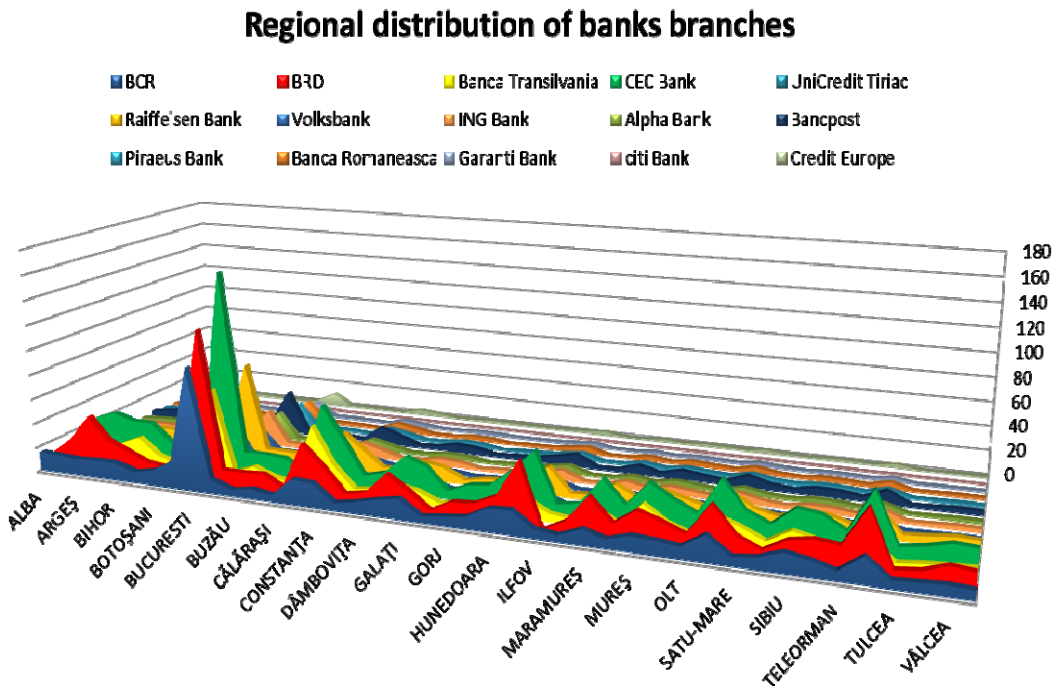
| | |
|---|---|
| **IHH 2009** | 0.0847 |
| **IHH 2010** | 0.0862 |
| **IHH 2011** | 0.0870 |
| **IHH 2012** | 0.0840 |

With regards to the concentration level, the banking market in Romania is atomized, with highly competitiveness, as for the results obtained after calculating the IHH in case of Top 15 Banks in Romania.

Considering this result and the market share mentioned above, it was analyzed the regional distribution of banks units within the 41 Romanian countries. The results show that there is not a perfect correlation between the market share or assets and the number of banks units. Therefore, CEC Bank – that is on 4$^{th}$ place in terms of assets, is the leader on regional distribution of branches, having the most important spread within the territory (over 1000 units). The second place is occupied by BRD- Group Societe Generale, followed by BCR and Raiffeisen Bank.

Other important aspect showed by this analysis is the most important cities in which the banking activity is concentrated: Bucharest (registering the highest number of units/squared meter – being the exception on the general overview of the banking market).

**Figure 2.** *Regional distribution of banks (Sept. 2013)*

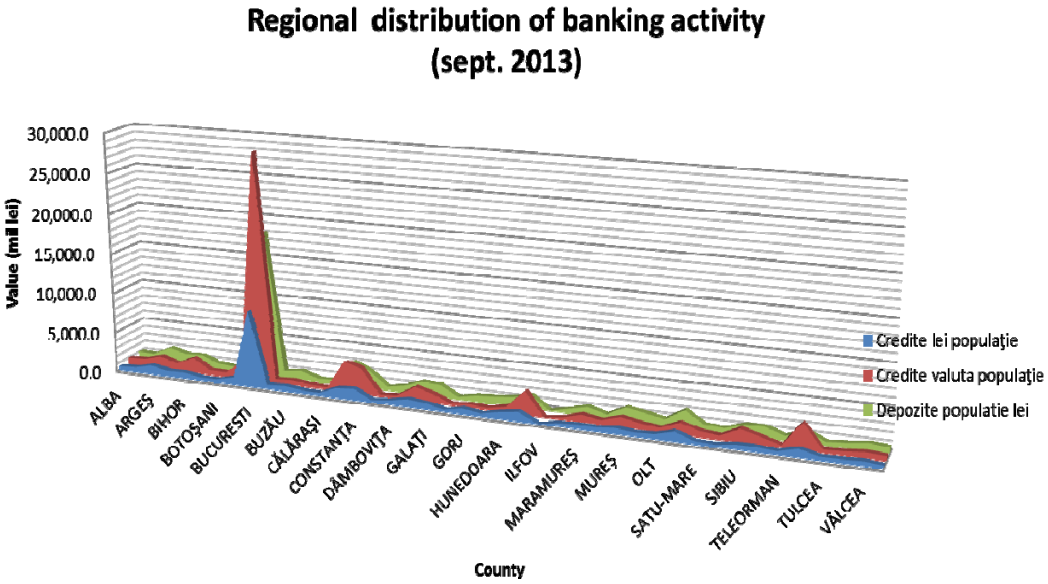



**Source:** banks websites.

Other countries in which the banking activity has important values are: Constanta, Dambovita, Hunedoara, Olt, Maramures and Teleorman.

Similarities are registered in terms of banking activity considering the population lons (in RON and foreign currency) and the population economies (in RON). The most dynamic countries are: Bucharest (with the highest results on balance), Constanta, Hunedoara and Teleorman. Therefore, the regional distribution is most influenced by the population demand for banking products and services even in our days, when online or phone banking services are increasing.

**Figure 3.** *Regional distribution of banking activity (Sept 2013)*




**Source:** The National Bank of Romania.

## 2. Analyzing the banking spatial distribution within Giurgiu County

For a better understanding of the importance of the banks localization, it will be used as example, the Giurgiu County, applying the Nearest Neighbor Statistics. Decay statistical tool was used to establish existence of physical relationship as it affects socio-economic relationship within an entity.

The Nearest Neighbor (RN) is calculated: $2d\sqrt{\frac{n}{A}}$

where,
A – the size of the unit area concerned;
d – the mean distance between location of banks;
n – the number of points (banks in unit area);
$d = \frac{dobs}{n}$.
dobs – summation of the nearest neighbor distances.

In order to better exemplify the spatial distribution of bank's units, it was chosen the Giurgiu County for applying the Nearest Neighbor Statistic. The first step was to identify the total number of banks units existing in the County, not only in the main city. The research gave the following situation:

**Table 4.** *Number of banks units within Giurgiu County*

| | | | |
|---|---|---|---|
| **BCR** | **5** | **Raiffeisen Bank** | **3** |
| Bolintin Vale | 1 | Bolintin Vale | 1 |
| Sos.Bucuresti | 1 | Sos.Bucuresti | 1 |
| Str.Tineretului | 1 | Str.Portului | 1 |
| Str. Vlad Tepes | 1 | **Volksbank** | **1** |
| Mihailesti | 1 | Sos.Bucuresti | 1 |
| **BRD** | **3** | **ING Bank** | **1** |
| Bolintin Vale | 1 | Str. Piata Unirii | 1 |
| Sos.Bucuresti | 1 | **Alpha Bank** | **1** |
| Str. Vasile Alecsandri | 1 | Sos.Bucuresti | 1 |
| **Banca Transilvania** | **3** | **Bancpost** | **2** |
| Sos.Bucuresti | 1 | Str. Vasile Alecsandri | 1 |
| Str. Garii | 1 | Sos. Giurgiului | 1 |
| Zona Libera Giurgiu | 1 | **Piraeus Bank** | **0** |
| **CEC Bank** | **6** | **Banca Romaneasca** | **1** |
| Str. Garii | 1 | Sos.Bucuresti | 1 |
| Sos.Bucuresti | 1 | **Garanti Bank** | **1** |
| Mihailesti | 1 | Str. Piata Unirii | 1 |
| Bolintin Vale | 1 | **citi Bank** | **0** |
| Clejani | 1 | **Credit Europe** | **1** |
| Colibasi | 1 | Str. Piata Unirii | 1 |
| **UniCredit Tiriac** | **1** | | |
| Sos.Bucuresti | 1 | | |

Considering the main neighbors, it can be summarized as:

**Table 5.** *Number of banks units within Giurgiu County*

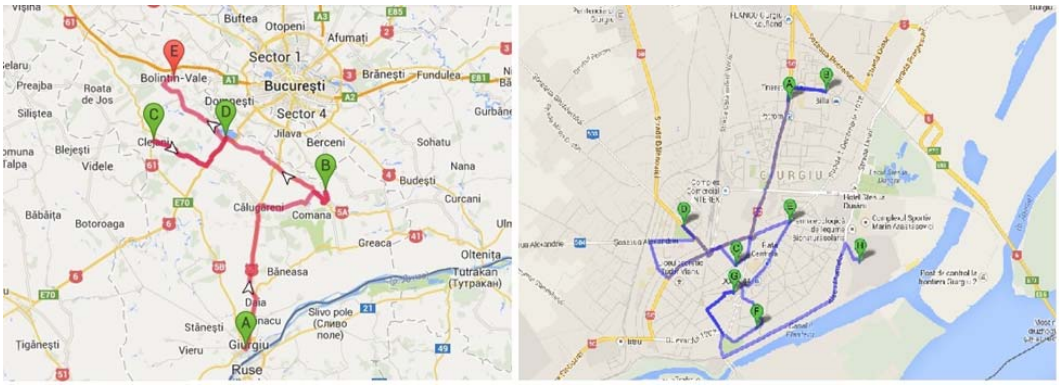
| | |
|---|---|
| Bolintin Vale | 4 |
| Mihailesti | 2 |
| Clejani | 1 |
| Colibasi | 1 |
| Sos.Bucuresti | 9 |
| Str. Tineretului | 1 |
| Str. Vlad Tepes | 1 |
| Str. Vasile Alecsandri | 2 |
| Str. Garii | 2 |
| Str.Portului | 1 |
| Str. Piata Unirii | 3 |
| Zona Libera Giurgiu | 1 |

After applying the Nearest Neighbor Statistics it was obtained a coefficient of 1.69 which was interpreted using Kings Scale, showing that the banks are located random in the territory, not showing any clustered sign.

**Table 6.** *Statistics results*

| A (square m) | Dobs(m) | d (m) | n | Rn |
|---|---|---|---|---|
| 3526000000 | 266500 | 95.7 | 28 | 1.69 |

In order to better visualize the spatial distribution within the territory, please see the below maps showing the routes of the distances for both County (map A) and Giurgiu city (map B).




A B

**Map 1:** *the territory distribution of banks units within Giurgiu County (A), respective in Giurgiu City (B).*

The explanation for the obtained results is given by the territory location of the chosen County near the Capital, which might explain the unusual dispersion of the units. Also, another explanation can be the general situation of the people living in this area. Giurgiu is one of the last countries from Romania that is characterized by poorness, low level of wages, high number of social cases, low level of demand for banking products and services.

## Conclusions

The statistical tests applied within this paperwork showed that the banks within Giurgiu are located random in the territory, not showing any clustered sign.

It must be mentioned that this country has large inequalities within the economic activities and the trade, constructions and food industry are the ones that dominate the region. The microeconomic development is reduce at global level and the number of banks unit is very small compared with the country situation. Almost

72% of banks units are concentrated within the country residence that shows important regional disparities.

Giurgiu is located near the Capital, which might explain the unusual dispersion of the units. Also, another explanation can be the general situation of the people living in this area. Giurgiu is one of the last countries from Romania that is characterized by poorness, low level of wages, high number of social cases, low level of demand for banking products and services.

## References

Bertrand, M.R. (1995). *Theory of Markets, Trade and Space-time Patterns of Price Fluctuations*, Springer-Verlag, Berlin

Fujita M., Krugman, P. and Venables A, (1999). "The Spatial Economy – Cities, Regions and International Trade", Library of Congress in Publication Data

Galiani, S., Lamarche, C., Porto, A. and Sosa-Escudero, W. (2005). "Persistence and regional disparities in unemployment", *Regional science and Urban Economics*, 35, pp. 375-394

Mills, E.S and Nijkamp, P. (1987). "Advances in Urban Economics", Handbooks in Economics, Vol. 2, Urban Economics

Pissarides, A.C. (2000). *Equilibrium Unemployment Theory*, MIT Press

European Central Bank (2008, 2009). Annual Reports (Online), August 2012, http://www.ecb.int/pub/annual/html/index.en.html

National Bank of Romania (2009, 2010, 2011, 2012). Annual Reports (Online), September 2013, http://www.bnro.ro/Publicatii-periodice-204.aspx

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# The impact of the current financial and economic crisis on the European labor market – an approach based on a new paradigm in the labor field

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**Abstract.** *In this article I followed two directions simultaneously. The first direction analyzes the structure of the European labor market, the evolution of the unemployment and the relationship between the labor market and globalization in the economic downturn context. The second one evaluates the financial and economic crisis's consequences on international migration to and from Europe and on occupational mobility within the European Union. Overall, while taking advantage of free movement, migrants appeared from extension of the European Union represent a flexible and valuable resource that can act as a buffer during economic imbalances. Repeated migration is expected to reduce the negative impact of the crisis, leading to brain circulation rather than brain drain and a more efficient allocation of resources within the European Union. Labor market starts to recover slowly after a huge drop in economic activity, but yet in the context of economic growth, the unemployment rate remains low (especially among youth) compared to pre-crisis level of this indicator.*
*The purpose of this paper is to highlight the need for improved employment policies, by creating more and better jobs, while providing an appropriate response to the challenges of demographic aging and of the intensified global competition within a new paradigm of the economy of knowledge.*

**Keywords:** EU labor markets, EU enlargement, labor mobility, economic crisis, migration, youth unemployment.

**JEL Classification:** J21, J61, J62, J64, F66.
**REL Classification:** 12G .

## 1. Introduction

The labor market in a broad sense includes problems as employment, unemployment, work quality, productivity, earnings and labor cost. This makes the labor market to be among the key topics in social and political debates in the European Union. Not coincidentally, Europe 2020 Strategy use as the main indicator the employment rate.
The economic and financial crisis that started in 2008, as opposed to Asian crisis or the oil crises, had spread globally and had serious consequences in areas such as construction, manufacturing, financial services and tourism. Consequently, both developed and developing countries had faced and continue to face major changes in the labor market due to the increasing number of unemployed and a high level of poverty. A negative and persistent evolution of the unemployment, along with the reduced chances for an unemployed person to find a job could lead to a harsh period of time, characterized by a high unemployment rate on long term. Another important aspect is the lack of opportunities for young people regarding their entry into the labor market. Looking ahead, the lack of work experience or the mismatch between skills and jobs for young people will inevitably lead to a future workforce with low skills and low productivity levels.
The professional mobility in the European Union has increased slightly over time, but it still remains a phenomenon that influences only a minority of the population. The number of working age native Europeans living in another EU country was about 10 million in 2012, an increase of more than 50% (3.8 million), compared to 2005. In addition to the two recent waves of enlargement, the crisis had a profound impact on emigration trends and has generated new models, which had a double effect: the creation of a new corridor (South–North) and the appearance of new destinations outside Europe.

## 2. The structure and size of the European labor market in the crisis context

### Unemployment rate

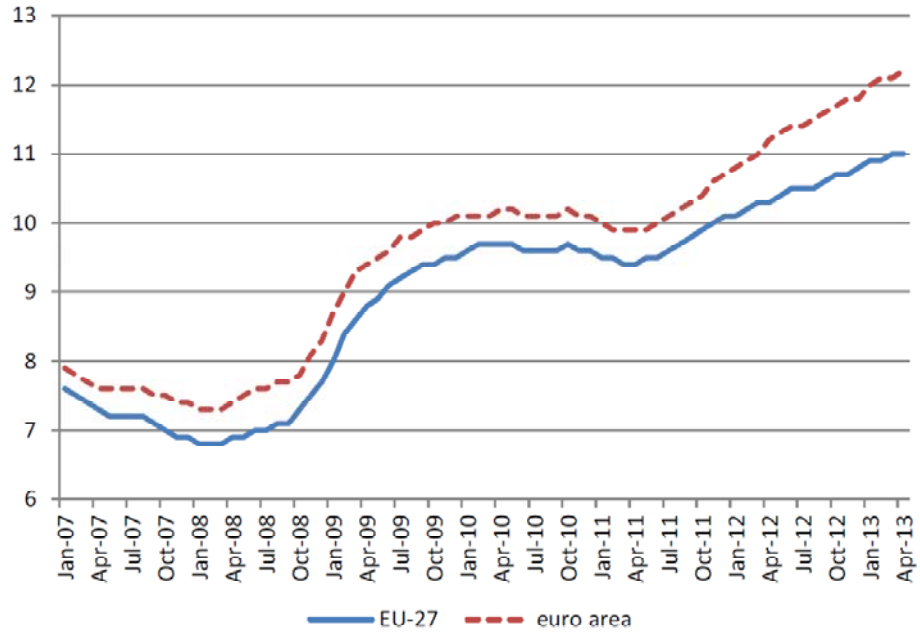
Until the crisis the European labor market had a relatively well evolution, especially for the new member states. For example, in 2007 the number of employed persons increased by 3.5 million from 2006. Also, the reduction of the unemployment rate has not led to an acceleration of inflation, because the level of unemployment at which the wage pressure is produced had decreased. In 2008, the unemployment rate was below 10% for all member states, except for Spain (11.3%). The lowest unemployment rates were in Poland (2.5%), Denmark (3.3%), Cyprus (3.6%) and Austria (3.8%).

Since 2008, the economic and financial crisis has passed from the collapse of the US financial sector to a slowdown in economic activity, with a significant impact

on labor markets in Europe. Increasing uncertainty and rapidly changing economic conditions had become the basic European labor market environment. The economic crisis has affected all major economies simultaneously, which made the recovery to become more difficult. The significant impact of the crisis which began in 2008 on labor markets in developed economies intensified in 2009 and has spread to emerging markets and developing countries, mainly due to strong contraction of international trade. European labor market began to weaken considerably in the second half of 2008 and continues deteriorated during 2009. In 2009, the labor market situation has changed considerably, seven Member States recorded unemployment rates above the target of 10% – Spain, Latvia, Lithuania, Estonia, Slovakia, Ireland and Hungary (European Commission, 2013).

The EU unemployment rate has risen steadily over the past two years to April 2013 and it rose to 11.0% (Figure 1)[(1)]. This increase comes after the one during the financial crisis, when the 25 months between March 2008 and April 2010 saw 7.3 million more people in the EU who have lost their jobs. The current increase is less pronounced than the previous one, but is a persistent one and it is continuing the one which began in early 2008 (EPC Issue Paper, 2013).

**Figure 1.** *The evolution of unemployment rate in the EU and in the euro area*



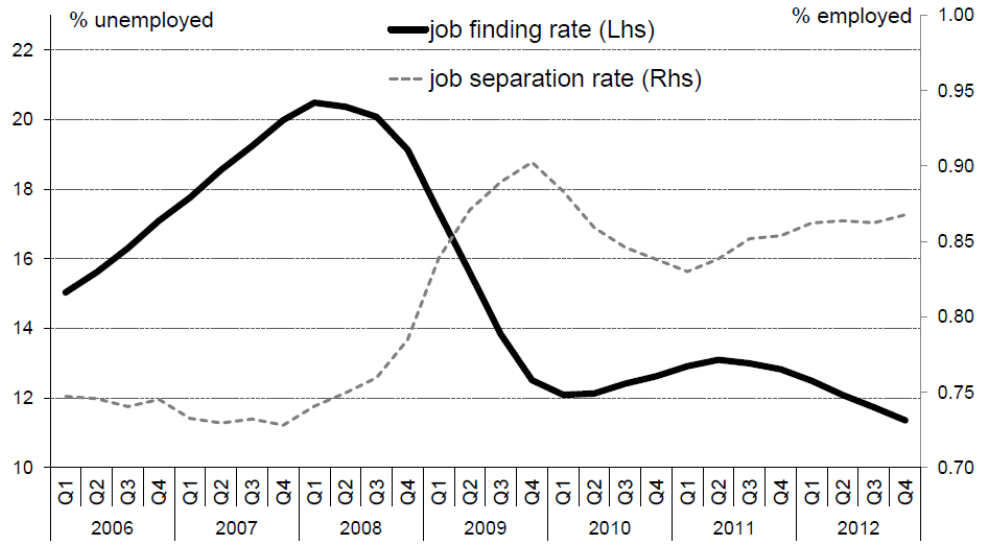

**Source:** Eurostat.

## Finding rates and job loss

With the start of the crisis and to date, the rate of finding a job in the EU has been a downward trend. This indicator fell below 12% in the third quarter of 2012,

from an average of over 20% five years ago. The rate of job losses in the EU remained high in 2009, rising to 0.87% moderate in the fourth quarter of 2012, with 0.14 percentage points more than five years ago.

**Figure 2.** *The evolution of finding rates and job losses in the EU*




**Source:** Eurostat.

Maintaining a high and constant level of the difference between finding rates and job losses with continuous upward trend in the unemployment rate indicates that it will be increasingly difficult for an unemployed person to find a job. This can be extremely dangerous, given the fact that the productivity and the knowledge for the potential employees tend to decrease in proportion to the period of inactivity. An indicator that highlights these imbalances is long-term unemployment.

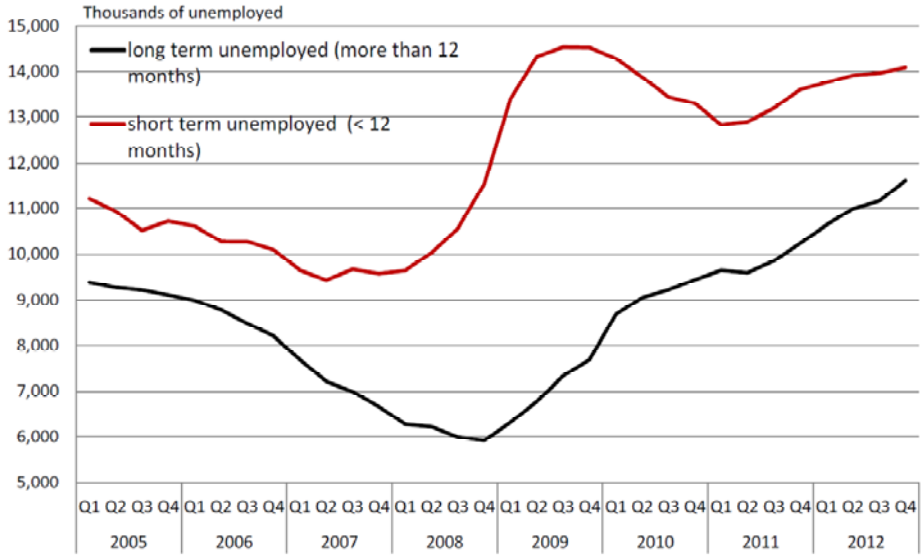
**Long-term unemployment**

Long-term unemployment in the EU has risen sharply, reaching the last quarter of 2013 a record of 11.6 million unemployed, more than 13.5 % (or 1.4 million more people ) to the same period in 2011 (Figure 3). This number is almost twice as high as four years ago, it is a record (European Commission, 2013).

Long-term unemployment situation worsened again in most Member States, at the end of 2012. The long-term unemployment rate increased in 19 Member States in 2012. It was a particularly dramatic growth in Greece, where the rate increased to 16.8 % (+5.9 percentage points). Also increased in Spain to 12.2% (+2.3 percentage points), in Cyprus, to 4.4 % (+2.2 percentage points), in Portugal, 8.8 % (2 1 percentage points) and Italy 6.4% (+1.5 percentage points). The number of

people in the labor force who were unemployed for more than a year has reached or exceeded the highest in the EU and the euro area, since the year 2000 in eight Member States: Greece, Spain, Portugal, Italy and Cyprus, but also Slovenia (4.7%), France (4.2%) and Luxembourg (2.1%). Among the EU, Austria has the lowest rate of long-term unemployment (1.1%).

**Figure 3.** *The Evolution of the long-term unemployed in the EU*

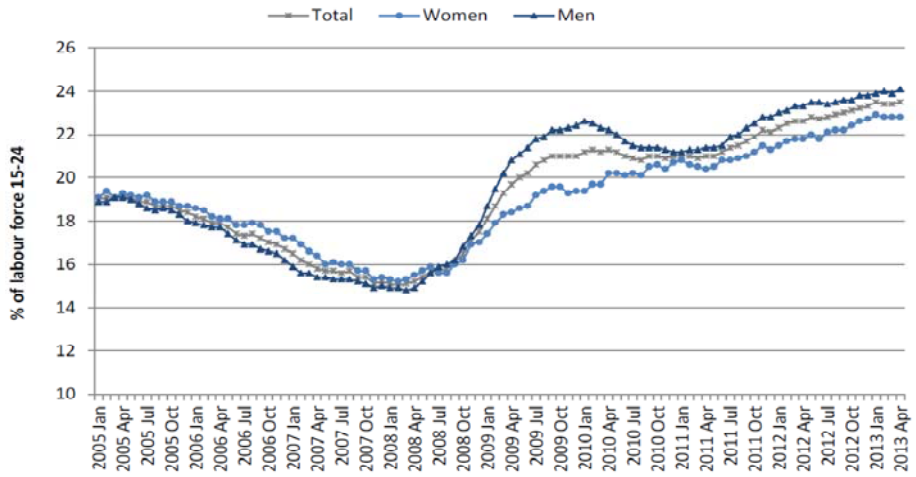



**Source:** Eurostat.

## Unemployment among young people

Economic crisis may have severe consequences on young people who face a lack of opportunities in terms of entering the labor market. Almost all EU members recorded high levels of unemployment among young people. Young people are far more affected than those over 25 years. Rising unemployment for youth category is alarming, considering that before the crisis the number of unemployed youth was already 2.8 times higher than for older people in Europe.

**Figure 4.** *The evolution of EU youth unemployment rate (15-24 years)*




**Source:** Eurostat.

## 3. The consequences of the crisis on mobility in the EU

### Assessing the impact of the crisis on mobility from an network-economics perspective

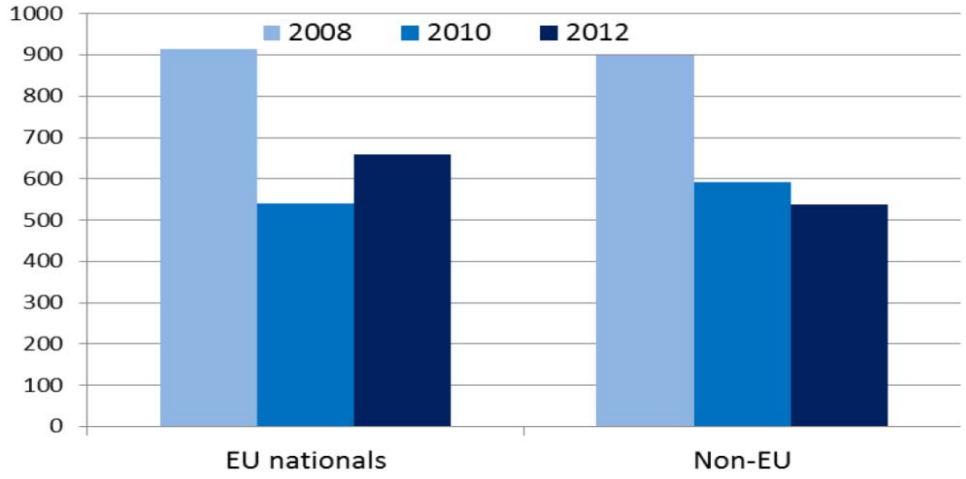
Network perspective seeks dynamic networks migration and the main migration corridors. Mobility of EU citizens has increased slightly over time, but still remains a phenomenon that implies only a minority of the population. The number of working age people that were born in EU, living in another EU country was about 10 million in 2012, an increase of more than 50 % (3.8 million), compared to 2005. In addition for the two recent waves of enlargement, the crisis has had a profound impact on mobility trends and has created new models, which take the form of a double effect on mobility, the creating a corridor south-north and the emergence of new destinations outside Europe.

I will examine the impact of the crisis on mobility, considering the two phases of the economic crisis, the first one that had duration of two years, from 2008 until the end of 2010 and the second one beginning in 2011 and continuing to the present. The crisis had a dual effect on mobility trends.

On the one hand, there was observed a reduction of migration flows during the symmetric phase of the crisis, between 2008 and 2010, when all European countries were hit simultaneously by the economic storm (Zaiceva and Zimmermann, 2013). There are two reasons for the decline in migration during the symmetrical crisis. First, Europe as a whole suffered from the crisis, including countries that were characterized as host, which saw declining their comparative

advantage. Second, the crisis has significantly affected the revenue of the potential mobile workers, who have become more reluctant to assume the risk and therefore postponed the decision to work in another country (Figure 5). However, even if the marginal rate of those who chose to work in a foreign country, an EU member in the periods 2008-2010 and 2010-2012 is lower than before the crisis, the absolute level of migration flows continued to grow continuously over the last decade.

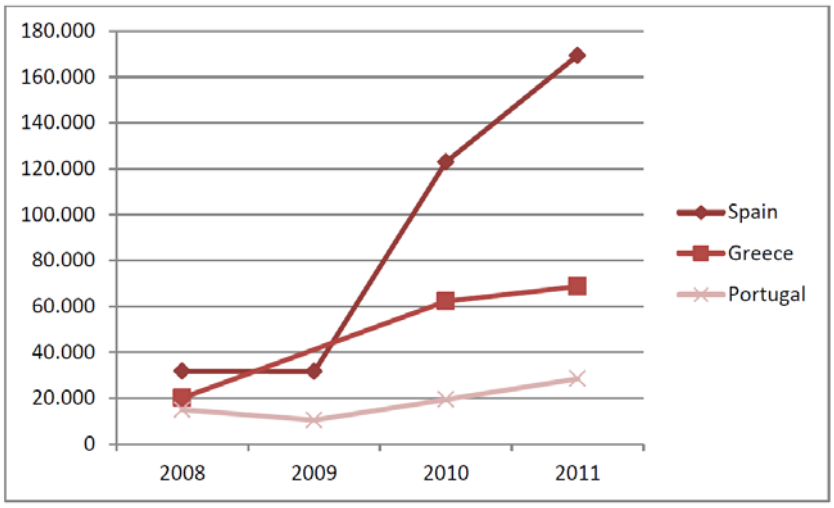
**Figure 5.** *The evolution of foreigners from the EU and outside the EU working in the EU up to 2 years*




**Source:** Eurostat

On the other hand, a general increase in mobility has taken place since 2010, when the asymmetric phase of the crisis started. During this period, the intense economic divergences between member states and the new mobility models began to appear. Therefore, some countries, like Germany, have found a way out of recession and returned to growth, while many others have fallen back into recession, with a huge impact on unemployment. For example, Spain and Ireland are the main host countries where the flow of immigrants has decreased substantially with economic downturn. These differences in labor market performance shown by a significant difference in unemployment explained the increased mobility during the asymmetric phase of the crisis. In this context, some previous trends such as the EU2[(2)] to Italy or the EU8[(3)] to UK continued, even if at a lower level compared to the previous 2007-2009 period. The asymmetric economic recovery some states has led the mobility of "southern economies affected"[(4)] to the "Nordic economies recover". The asymmetric phase of the crisis led to the creation of a migration corridor called third corridor "north-south".

**Figure 6.** *The evolution of migration flows from Spain, Greece and Portugal*




**Source:** Eurostat.

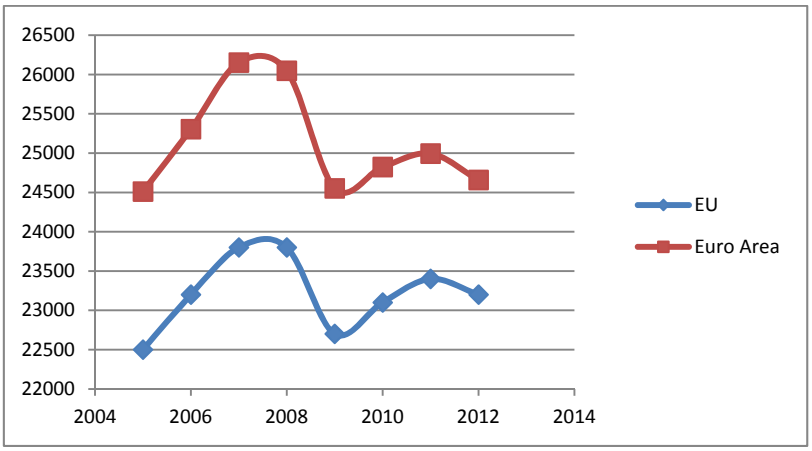
The crisis has affected not only the nature of the flows within the EU, but the role that non-European destinations have in the field of migration. Recent data have shown that European residents began to emigrate to countries outside Europe whose economies are booming. The trend is especially evident in Portugal, where the National Statistics Institute reported a significant increase in immigration from Portugal to non-EU destinations. The institute indicates an increase of over 3.5 times between 2010 and 2011, i.e. from 4342 to 15507 Portuguese people leaving the country for a destination outside Europe.

**Assessing the impact of the crisis on the mobility from a macroeconomic perspective**

This approach sees the European labor market as a whole. The mobility analysis is done on the whole, taking into account only the evolution of the stock of European Union citizens living and working in another EU country.

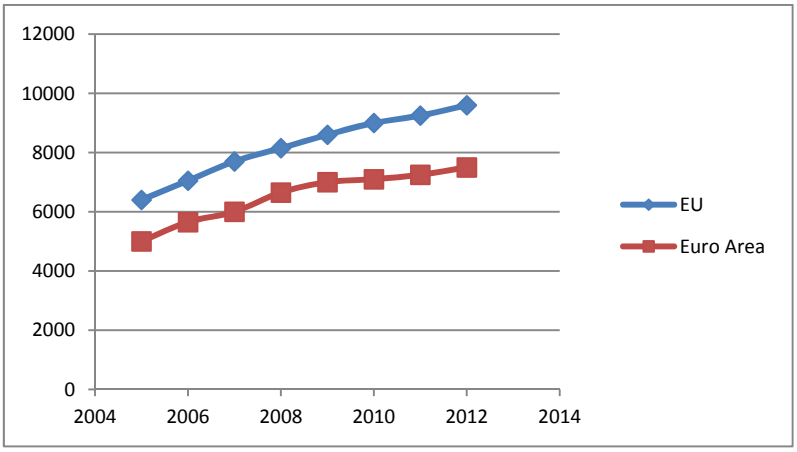
In order to study the impact of the crisis on mobility in the European Union, I have developed two econometric calculations, the first one(5) to highlight the relationship between economic activity and mobility within the European Union and the second one(6) to highlight the relationship between economic activity and mobility within the Euro Area. For this, I used as a data source two indicators showing economic activity and degree of mobility within the European Union/ Euro Area, real GDP per capita and that the evolution of stocks of European citizens living in another European country.

**Figure 7.** *The evolution of real GDP per capita*




**Source:** Eurostat.

**Figure 8.** *The evolution of stocks of European citizens living in another EU country (million)*




**Source:** Eurostat.

The correlation coefficient between the two indicators for the European Union is 0.24. This result shows that the link between the two indicators is a weak one. So, we can say that business cycle fluctuations, including the current recession did not have a significant impact on the evolution of migration flows in the European Union.

## Conclusions

The economic and financial crisis from 2008, unlike the Asian or the oil crisis, had spread globally and had serious consequences in areas such as construction, manufacturing, financial services and tourism. Consequently, both developed

countries and developing ones have faced and continue to face major adjustments in the labor market due to the increasing unemployed and to a high level of poverty. The negative and persistent trend unemployment rate, along with reducing the chances of unemployed people to find a job could lead to a tragic period, characterized by high levels of long term unemployment.

Another important aspect is the lack of opportunities for young people for entry into the labor market. Looking ahead, lack of work experience or mismatch between skills and jobs for young people will inevitably lead to future workforce lacking skills and low productivity levels.

Regarding migration flows, things are not as bad as in the labor market. There were two stages of crisis, which have influenced the migration differently. In the first phase, the symmetric crisis, there was a general brake on EU migration flows as a result of the economic downturn in all member states. In the second phase, the anti-symmetric, the migration phenomenon had resumed due to the emergence of differences between countries that have experienced economic growth and those that have deepened the recession. On the whole, the phenomenon of migration has undergone continuous development, especially with the recent enlargements of the European Union.

Occupational mobility, especially referring to people with a high level of training, is a process relevant to the European labor market structure. The proportion of potential migrants is higher in countries hit harder by the crisis. Repeated and circular migration is expected to reduce the negative effects of the crisis, leading to a more efficient allocation of resources within the European Union.

The research within this article has shown that the business cycle fluctuations have a limited impact of migration. Therefore, when considering occupational mobility, we should take into account a broader range of factors in the decision to emigrate, as the influence of social networks, personal preferences or the current institutional framework on the labor market.

Labor market policies should play a complementary role in response to the crisis, along with other macroeconomic policies to maintain labor demand by creating new jobs, retaining existing ones and improve employment opportunities for the unemployed, increasing compatibility between demand and labor supply.

The most important occupational policy objective should be the creation of more and better jobs, while providing an appropriate response to the challenges of demographic aging and intensifying global competition in the knowledge economy.

## Notes

(1) In this article I did not take into account the economic evolution of Croatia because it is irrelevant for the crisis impact on the European labor market analysis.
(2) EU2 represents the group of countries formed by Romania and Bulgaria.
(3) EU 8 represents the group of countries formed by Czech Republic, Hungary, Poland, Slovakia, Slovenia, Estonia, Latvia and Lithuania.
(4) The most affected countries by the crisis are: Spain, Greece and Portugal.
(5) The used database for the calculation and the calculation itself can be found in Appendix 1.
(6) The used database for the calculation and the calculation itself can be found in Appendix 2.

## References

Beets, G. and Willekens, F. (2009). "The global economic crisis and international migration: An uncertain outlook", *Vienna Yearbook of Population Research*, pp. 19-37

Beleva, I. (2011). "European Labor Markets Challenges in the Context of the Europe 2020 strategy", Economic Research Institute, BAS, July

Schmillen, A. and Umkehrer, M. (2013). "The scars of youth. Effects of early career unemployment on future unemployment experience", *IAB Discussion Paper*, June

Zaiceva, A. and Zimmermann, K.F. (2013). "Returning Home at Times of Trouble? Return Migration of EU Enlargement Migrants during the Crisis", Center for Economic Research, *Working Paper,* 89, February

EPC Issue Paper (2013). "Making Progress towards the Completion of the Single European Labor Market", European Policy Centre, May

European Commission (2013). "EU Employment and Social Situation", *Quarterly Review,* June

Appendix 1. Econometric calculations for the European Union

| Year | X | Y | x - x̄ | $(x-\bar{x})^2$ | y - ȳ | $(y-\bar{y})^2$ | (x - x̄) (y - ȳ) |
|---|---|---|---|---|---|---|---|
| 2005 | 6400 | 22500 | -1818,75 | 3307851,56 | -712,5 | 507656,25 | 1295859,38 |
| 2006 | 7050 | 23200 | -1168,75 | 1365976,56 | -12,5 | 156,25 | 14609,38 |
| 2007 | 7700 | 23800 | -518,75 | 269101,56 | 587,5 | 345156,25 | -304765,63 |
| 2008 | 8150 | 23800 | -68,75 | 4726,56 | 587,5 | 345156,25 | -40390,63 |
| 2009 | 8600 | 22700 | 381,25 | 145351,56 | -512,5 | 262656,25 | -195390,63 |
| 2010 | 9000 | 23100 | 781,25 | 610351,56 | -112,5 | 12656,25 | -87890,63 |
| 2011 | 9250 | 23400 | 1031,25 | 1063476,56 | 187,5 | 35156,25 | 193359,38 |
| 2012 | 9600 | 23200 | 1381,25 | 1907851,56 | -12,5 | 156,25 | -17265,63 |
| Total | 65750 | 185700 | | 8674687,5 | | 1508750 | 858125 |

$\bar{x} = 8218,75$

$\bar{y} = 23212,5$

X – the stocks of European citizens living in another EU country (mil.)

Y – real GDP per capita in EU

$$\boldsymbol{R(x,y)} = \frac{\Sigma(x-\bar{x})(y-\bar{y})}{\sqrt{\Sigma(x-\bar{x})^2}\sqrt{\Sigma(y-\bar{y})^2}}$$

$$\boldsymbol{R}\,(\boldsymbol{x},\boldsymbol{y}) = \frac{858125}{\sqrt{8674687,5} * \sqrt{1508750}} = \frac{858125}{2945,28 * 1228,31} = \frac{858125}{3617716,87} = 0,24$$

Appendix 2. Econometric calculations for the Euro Area

| Year | X | Y | x - x̄ | $(x-\bar{x})^2$ | (y - ȳ) | $(y-\bar{y})^2$ | (x - x̄) (y - ȳ) |
|---|---|---|---|---|---|---|---|
| 2005 | 5000 | 24511 | -1518,75 | 2306601,56 | -619,3 | 383470,56 | 940485,94 |
| 2006 | 5650 | 25305 | -868,75 | 754726,56 | 174,8 | 30537,56 | -151814,06 |
| 2007 | 6000 | 26152 | -518,75 | 269101,56 | 1021,8 | 1043973,06 | -530032,81 |
| 2008 | 6650 | 26047 | 131,25 | 17226,56 | 916,8 | 840430,56 | 120323,44 |
| 2009 | 7000 | 24552 | 481,25 | 231601,56 | -578,3 | 334373,06 | -278282,81 |
| 2010 | 7100 | 24823 | 581,25 | 337851,56 | -307,3 | 94402,56 | -178589,06 |
| 2011 | 7250 | 24994 | 731,25 | 534726,56 | -136,3 | 18564,06 | -99632,81 |
| 2012 | 7500 | 24658 | 981,25 | 962851,56 | -472,3 | 223020,06 | -463395,31 |
| Total | 52150 | 201042 | | 5414687,5 | | 2968771,5 | -640937,5 |

$\bar{x} = 6518,75$

$\bar{y} = 25130,25$

X – the stocks of European citizens living in another EU country from Euro Area (mil.)

Y – real GDP per capita in the Euro Area

$$\boldsymbol{R(x,y)} = \frac{\Sigma(x-\bar{x})(y-\bar{y})}{\sqrt{\Sigma(x-\bar{x})^2}\sqrt{\Sigma(y-\bar{y})^2}}$$

$$\boldsymbol{R}\,(\boldsymbol{x},\boldsymbol{y}) = \frac{-640937,5}{\sqrt{5414687,5} * \sqrt{2968771,5}} = \frac{-640937,5}{2326,94 * 1723} = \frac{-640937,5}{4009317,62} = -0,16$$

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# Perspectives on FDI in the context of economic crisis

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**Abstract.** *Over time, ways of investing and the factors influencing this process have continuously evolved. The starting point was traditional trade, moving to export and then finally getting to international investment. Investors, policy makers and researchers have become increasingly concerned with identifying the factors that determine the investment decision and also the conditions that can increase international investment. There are several studies on this topic, and we have chosen to go over the most relevant in the first part of the paper. In the second part we analyze the evolution of FDI before and during the economic downturn, defining specificity and implications for Romania. In the third part of the paper we analyze some measures designed to boost FDI.*

**Keywords:** foreign direct investment, economic crisis, economic growth.

**JEL Classification:** F21.
**REL Classification:** 8B, 8E, 10H.

## Introduction

Due to results of studies on several developing countries, foreign direct investments (FDI) are considered a propeller with long-term impact on economic growth. Their determinants and effects have been amply studied by researchers. The role of FDI should be seen not only by quantitative, but also by qualitative perspective because, by their nature, they are important means of financing development, and also sources of technology and know-how transfer beyond national area (Romer, 1993; OECD , 2007).

FDI can generate a large capacity for stimulation and engagement. They bring the potential for greater growth and development in transition economies than in developed ones. They are different from other forms of capital by their nature, the period of engagement, type of commitment and a lower degree of volatility (Barrell and Holland, 2000). For transition countries, this type of investment is a way to achieve goals and remove organizational gaps through techniques brought in (Barrell and Holland, 2000). It is known that "FDI benefits' to host countries can be significant, including knowledge and technology transfer to local firms, jobs, management enhancements, productivity gaps, increased competition and increased access to export, especially origin countries" (Demekas et al., 2005).

Unlike portfolio investment, foreign direct investment are made on medium and long term and are sensitive to factors that influence macroeconomic, political, and institutional stability, indicators related to these issues being particularly significant for investors. A growing number of firms from many countries increasingly extend and invest across borders, so that at this time all economies compete on the factors that influence the patterns of investment, in order to attract more FDI. This increased competition is based on lower volatility compared to other investments (IMF (2007) World Economic Outlook), on the nature and duration of commitment that they imply (Barrell and Holland, 2000), on the fact that they do not bring debt in host countries, so that they are a preferred method of financing current account deficits, especially in developing countries with high deficits. Meanwhile, as markets and economies liberalization is becoming stronger, there are other opportunities that also favor the emergence of new risks for developing countries.

Some researchers argue that FDI contribute more to economic growth and development of a country than other capital flows. Scholars such as Alfaro, L (2003) and Borensyen, Gregorio and Lee (1998) empirically demonstrate that FDI lead to an increase in wealth, not only of countries. One of investors' objectives is to establish commercial relations abroad and to exercise increased influence by branches.

In order to decide on a new location, investors have now come to realize complex studies, seeking advantages to maximize profit and where there such advantages lack, they try to create them by exerting power over governments and influencing certain economic and political decisions. Along with economic and political stability, transparent and favorable regulatory environment regarding foreign ownership and repatriation of profits, are together determinants of the decision on foreign direct investment (Demekas et al., 2005).

The literature devoted to the determinants of FDI identifies besides traditional factors, aspects that refer to politics, country risk and the progress in transition. Traditional factors include market size, natural resources, openness, distance, economic and political stability, skills and culture of workforce. Among political factors we mention market law, employment law, taxation and infrastructure. Yeaple (2009) states that countries with an investment environment that offers many advantages to investors attract a larger number of multinational companies. Hayakawa, Lee and Park (2010) confirm Yeaple's conclusions and demonstrate that host countries that have a better investment environment, larger markets and lower fixed entry costs, attract more foreign investors. Therefore, the host country's investment environment is very important in attracting foreign direct investment. Lansbury, Pain and Smidkova (1996) conducted an econometric analysis of the factors influencing the characteristics of FDI in the Czech Republic, Slovakia, Hungary and Poland for the period 1991 to 1993, finding as drivers human capital, technological facilities and economic infrastructure.

Carstensen and Toubal (2004) examined FDI for 8 countries in Central and Eastern Europe over the period 1993-1999 using dynamic panel analysis. They determined that a number of traditional factors, such as market size, the cost of trade, firm specific costs, provision of inputs, and also specific transition factors (such as the development of the private business, the method of privatization) and the risk associated to host country can influence the investment decision. Tintin (2013) investigates the determinants of FDI inflows for the six countries of Central and Eastern Europe over the period 1996-2009 by including traditional and institutional variables in a panel. The results certify the positive influence of GDP, openness of the economy, economic freedom, state fragility, political rights and civil liberties indices.

Analysis of empirical studies shows that the distribution of FDI between CEE countries is influenced, in addition to traditional factors (GDP per capita, labor costs facto level of taxation, etc..), by factors related to the institutional development, progress in terms of transition and risk factors. Political stability, democracy, legal system, bureaucracy, infrastructure, corruption and ethnic conflicts are factors meant to influence FDI.

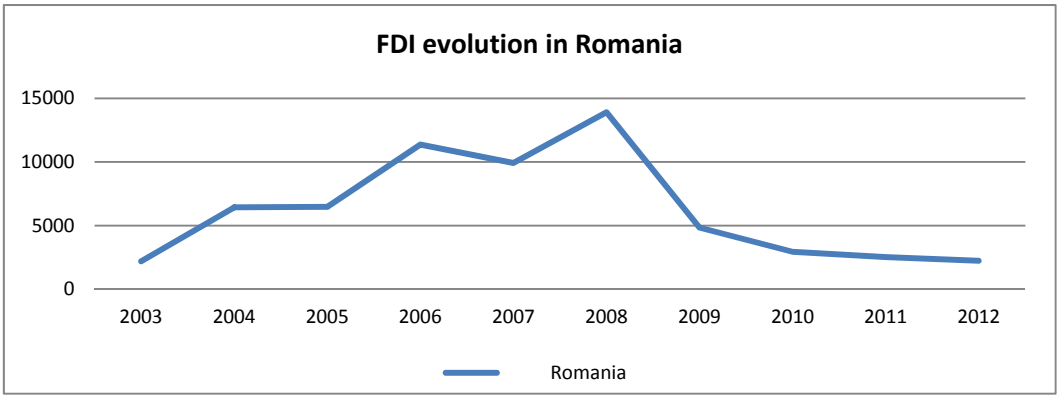
## FDI in Romania

In the early 1990s, after the fall of the communist block, Romania was perceived by investors as a relatively risky economy. Alongside with the countries of Central and Eastern Europe, Romania was characterized by zero unemployment, zero foreign debt, private property almost absent and the lack of experience and specific conditions for international investment. Basically, the foreign investment arose from scratch.

To finance the debt and stimulate economic growth, Romania needed and still needs international investment to cover current account deficits (Roubini and Wachel, 1998). Romanian economy went progressively from lack of experience in investing to the creation of an efficient investment environment. In this paper we will refer to the period 2003-2012.

In this period, Romania gradually progressed in terms of FDI, with different rhythms and consistency that the Romanian economy has taken from socialism to a market economy and then, in the institutional context, to the European Union. Figure 1 shows that 2008 was a culmination point of FDI to Romania, and after this moment a decline followed, because of the global economic crisis. According to our calculations, in 2012 FDI were higher than in 2003 with only 2%, which shows that, from this point of view, Romania has returned in time. In 2008 compared to 2007 IDS raised 40.18%, as 2008 was the year following the accession to the European Union. But the joy of this increase did not last long and in 2009 compared to 2008, FDI decreased by 65.17%. Declines then continued every year, reaching 2.2 billion euro in 2012, which is a dramatic decrease from 2008, when situated at 13.9 billion euro.

**Figure 1.** *FDI evolution in Romania, 2003-2012, mil. euro*




**Source:** UNCTAD Statistic Database, 2013.

This decline is also reflected by the activity of foreign-owned firms, as shown in Table 1:

**Table 1.** *Number of companies with foreign capital and subscribed capital in 2003-2011*

| | Number of companies | Subscribed capital (thousands of lei) | Subscribed capital (thousands of dollars) | Subscribed capital (thousands of euro) |
|---|---|---|---|---|
| 2003 | 6.609 | 4441402,8 | 1.288.885,00 | 996235,1 |
| 2004 | 10.167 | 9.040.577,50 | 3032218,4 | 2.343.732,90 |
| 2005 | 11.719 | 7.173.157,10 | 3.149.681,60 | 2.434.525,40 |
| 2006 | 12.823 | 6.646.972,20 | 3.127.314,60 | 2417237 |
| 2007 | 15.720 | 7.737.574,20 | 3.314.201,60 | 2369392,2 |
| 2008 | 12.264 | 15034925,8 | 5.924.852,80 | 3.984.432,80 |
| 2009 | 6.801 | 15.303.310,60 | 4.817.293,20 | 3512610,5 |
| 2010 | 6.302 | 17.430.494,70 | 5.144.560,80 | 3.914.440,60 |
| 2011 | 6.377 | 10.190.486,10 | 4659785 | 3329432,4 |

**Note:** The first column shows the number of registrations in the mentioned period. Data on the share capital include capital subscriptions in the reference period, plus capital raises, minus capital of radiated companies from register of trade.

**Source:** Companies with foreign participation. Statistical summary of data from the Central Trade Register on July 31, 2012.

In 2009 compared to 2008, there was a decrease in the number of companies with 44.5%, a decrease of 18.69% of the issued capital in dollars, and a decline of 11.8% of the issued capital in euro. The difference of 7 percent between the issued capital in dollars versus euro comes from lower global confidence in the dollar. Year 2011 brought a slight increase of 1.1% in the number of companies, but not in the subscribed capital in international currencies.

This decline in FDI has stimulated policymakers to rethink economic and investment conditions in Romania so that the investment environment in Romania reforms have intensified with the onset of the economic crisis.

Studies in the World Bank Doing Business Report since 2008 to date show that there have been taken several measures to stimulate companies, such as reducing the tax burden, improving taxation, reducing the number of days to register a property by specific measures related to the Land Registry and Cadastre, investor protection, substantial changes to the law of insolvency, change in the regulations of building permits in order to reduce taxes and acceleration of the process, the introduction of electronic payment of taxes and eliminating minimum annual tax, reducing the time for obtaining an approval certificate from the tax administration agency, which facilitates starting a business, strengthening the legal framework for secured transactions. An important advantage held by Romania is facile access to credit. According to World Economic Forum, Romania is ranked 12th out of a total of 185 countries.

Besides these positive measures, during the mentioned period, less favorable measures for the investment environment were also taken, including: the introduction of a new tax in the amount of 0.05 % of the project, in 2010, which increased the cost of construction, or the requirement of the tax certificate for starting a business in 2012.

The studies show that Romania's weaknesses are infrastructure and institutions, low efficiency in the goods and labor market and low public confidence in the political environment. These weaknesses are discordant with a survey of Ernst & Young conducted on 812 investors which shows that the most important geographical factors that an investor takes into account are: transport infrastructure and logistics (63%), telecommunications infrastructure (62%), stability and transparency of the political, legal and regulatory environment (62%).

These measures and developments are reflected in Romania's positioning in the competitiveness index rankings, as follows in Table 2.

**Table 2.** *Global Competitiveness Index 2011-2014*

| | 2012-2013 | 2013-2014 |
|---|---|---|
| Bulgaria | 62 | 57 |
| Czech Republic | 39 | 46 |
| Estonia | 34 | 32 |
| Hungary | 60 | 63 |
| Latvia | 55 | 54 |
| Lithuania | 45 | 48 |
| Poland | 41 | 42 |
| Romania | 78 | 76 |
| Slovakia | 56 | 62 |
| Slovenia | 71 | 78 |

**Source:** World Competitiveness Report, 2011-2012, 2012-2013, 2013-2014.

It can be seen that, compared to the countries of Central and Eastern Europe, in terms of competitiveness, Romania has the second smallest index, and according to the global ranking, it ranks 76 out of 145 countries, with a 2 step position improvement compared to 2012. Estonia has the best performance, located at 32, and Slovenia has the worst performance.

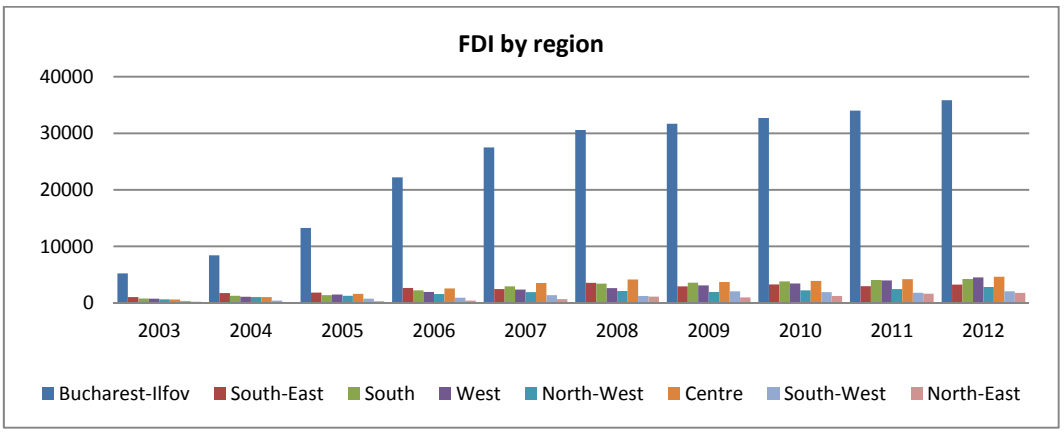
For 2012, the annual report on foreign direct investment made by the National Bank of Romania, show that the main countries that invested in Romania were the Netherlands (30.8%), France (16.0%), Italy (10.5%). For previous years, the first three places are also held by these three countries, but the difference is the change of position. The largest contribution to the rise in the rankings of our country had

Bucharest-Ilfov region recording the highest index of regional competitiveness between the 8 regions of Romania (Traşcă et al., 2013).

## FDI by region

National investments are calculated by summing the data at regional level. Romania has 8 regions, namely: Bucharest-Ilfov, South-East, South, West, North-West, Central, South-West, North-East. Figure 2 illustrates the level of FDI in each region during the period 2003-2012:

**Figure 2.** *FDI by region, 2003-2012, mil.euro*

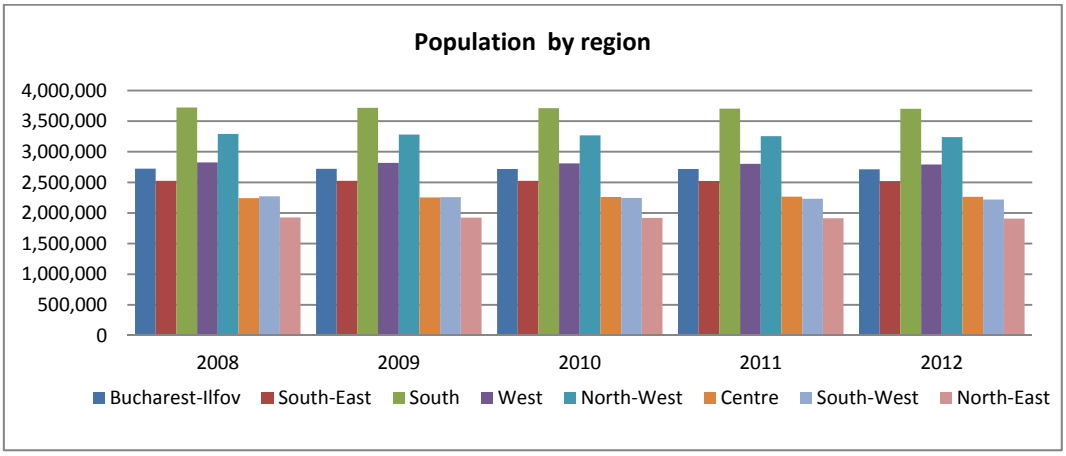



**Source:** Authors' calculations, data from NBR Annual Reports on FDI, 2003-2012.

There is a notable difference between foreign direct investments in Bucharest-Ilfov region and the other regions. While in 2003 this region took a share of 54.19% in the total foreign direct investment, in 2012 it reached a total weight of 60.64% in FDI. Bucuresti-Ilfov is the only region that has seen an increasing trend of foreign direct investment, in times of crisis. Shares of the other regions in total FDI are below 8%. Northeast region has the lowest share in total FDI, achieving a 2.9% share in total FDI for 2012 from 2.1% in 2003. Although it recorded the largest growth rate in 2012 compared to 2003, it maintains a low level of FDI. Southeast region holds the lowest growth rate of FDI. Its share in total FDI has decreased from 10.7% in 2003 to 5.5% in 2012.

Conventional sources of comparative advantages include, among others, market potential, factor prices and endowment of natural resources. One of the indicators showing market size is population. Figure 3 presents the evolution of the population on the 8 regions:

**Figure 3.** *Population by region, 2008-2012, millions*




**Source:** Authors' calculations, Eurostat data.

As can be seen, the region with the lowest level of FDI, namely Northeast, has the highest number of inhabitants, followed by the South region. The lowest level of the population is the West region, which does not show the highest level of FDI. Bucureşti-Ilfov region has a small number of people compared to the other regions, even though it has a higher density. Therefore, we conclude that foreign direct investors in Romania are not in search for market, but in search for resources and efficiency.

We have conducted a regional econometric model for FDI. Laconic data has limited our selection at two variables that we have considered most relevant in determining market potential and factor productivity. As a source of the comparative potential advantage we introduced the average number of hours worked per week by region, which comes to capture the physical productivity at regional level. For example, Helpman, Melitz and Yeap (2004 ) concluded that productivity plays an important role in the investment decision of multinational firms, as only productive firms can earn enough profit to retrieve increased costs of FDI. A higher level of labor productivity leads to lower production costs and increased return on investment. An increase in the number of hours worked shows a decline in efficiency and therefore a decrease in FDI. Therefore, we expect a negative relationship between this indicator and FDI.

Another relevant indicator in determining FDI by region is given by GDP per capita, which reflects the income and wages in the region, providing information on the degree of development of the region. A high level of income shows a greater demand for goods and services, which attracts foreign investment in

search for markets. Since there is no data available for this indicator we chose to replace it with the household income. In most studies, the relationship between FDI and GDP (income) is a positive one, so that we also expect it to be positive.

**Table 3.** *Description of variables*

| Variable | Definition | Relevance | Expected sign | Source |
|---|---|---|---|---|
| FDI | FDI stock in millions USD | Dependent | | BNR |
| Income | Income per capita (euro) | Traditional | + | EUROSTAT |
| Number of worked hours | Average number of hours worked by week | Traditional | - | EUROSTAT |

**Source:** Authors' calculations.

The data used in the model is annual data on FDI stocks for 2008-2012. The data summarizes a period of five years and this has led to the introduction in the model of a limited number of independent variables. The program we have used is Eviews 7. Regions analyzed are the Bucharest Ilfov, South-East, South, West, Northwest, Central, Southwest, Northeast. In order to maximize the number of observations we chose the use of panel data analysis.

The dependent variable is given by foreign direct investment stock, which we have obtained from the annual reports of the National Bank on FDI from 2008 to 2012. Specifically, we have associated the dependent variable and independent variables Average_Worked_ Hours_per week and Income_per capita. The model is based on the following equation:

$$FDI_{it} = \beta + \alpha_{i,t} X_{i,t} + \delta_{i,t} + \gamma_{i,t} + \varepsilon_{i,t,}$$

Where,
FDI is the dependent variable and it shows the stocks of foreign direct investment in region i at time t;
$\beta$ is the coefficient constant term;
$X_{i,t}$ is the vector of explanatory variables of the model;
$\alpha_{i,t}$ is the coefficient of explanatory variables;
$\varepsilon_{i,t}$ are error terms, the random variables;
$\delta_{i,t}$ and $\gamma_{i,t}$ are the values of cross-section or period specific effects (random or fixed);
i indicates the region;
t indicates the year.

We have first tested whether the model is valid using T-test and F-test. Another indicator showing whether the regression model is well specified is $R^2$. It shows how much of the total variance of the dependent variable is due to the independent variables. Then, we resorted to testing over the chosen method: the method of fixed effects and random effects method. To achieve this we have used the

Hausman test, which shows whether the orthogonality assumption is violated in the first case, i.e. fixed effects. When using the fixed effects method, free term can vary between countries but does not vary over time, while the slope coefficients are assumed to be constant across countries. This method assumes that the free term is deterministic, that is correlated with covariates (regressors vector) and is based on internal estimation, i.e. each observation is inside the country "i", over the entire period. In contrast, random effects method assumes that the free term is stochastic (random), i.e. uncorrelated with the variables and included in the error term. In other words, random effects method is consistent only if the free term is independent or uncorrelated with the regressors or with the error term. This test compares the estimates for the fixed effects and random effects. For the fixed effects, Hausman test tests the null hypothesis H0: fixed effects method is consistent and efficient versus H1: random effects method would be inconsistent. The test result is a vector of size k that will be distributed chi-squared. If the test statistic is high, then the fixed effects method should be chosen, and if the test statistic is low, then the random effects method should be chosen.

**Table 4.** *Results of the empiric study*

| Variables | Coefficient estimation |
|---|---|
| Income | 0,34 (1,56*) |
| Number of worked hours | -114,6<br>(-1,95,27) |
| Constant | 5052,39<br>(2,16**) |
| $R^2$ | 0,996 |
| Adjusted $R^2$ | 0,995 |
| Chi-squared | 13,24<br>(0,0001) |
| F-statistic | 867,29 |
| Number of observations | 40 |
| Number of groups | 8 |

**Source:** Authors' calculations.

**Note:** *p < 0.1, **p < 0.05, ***p < 0.001.

## Results of the empirical model

The value of $R^2$ is 0,996 while adjusted $R^2$ equals 0,995, suggesting that the relevant information of the independent variables describing the dynamics of the dependent variable is strong, while the small difference between the two figures shows that the introduction of new variables to the model resulted in an increase of its relevance. Analyzing the results according to Hausman test, chi-squared value is high and p<0.001, which means it is statistically significant and we reject the null hypothesis, namely there is not a significant difference between the estimated coefficients of the two models (one model is based on fixed effects method and the other is based on

random effects method). Therefore, we have fixed effects method for cross section level and random effects method for the period of time. This shows that the intercept may differ across regions, but does not vary over time, while the slope coefficients are assumed to be constant across regions. Such a model allows FDI to vary among regions, while FDI determinants should have similar effects on all regions analyzed. The model has the following form:

FDI= -114,6*No_worked_hours + 0,34*Income +5052,39 +[CX=F, PER=R]

The number of worked hours has a significance level of 1 %, which indicates that the variable has a significant influence on dependent variable. The negative sign indicates that an increase of one unit of the working hours will cause a decrease in FDI by 114.6 units, when other variables remain constant. The results show that decreases in the number of working hours, which is proof of efficiency, cause higher levels of FDI.

According to the empirical analysis, income has an average degree of significance on the level of FDI (p-value<10%). When it changes by one unit, the ISD change by 0.34 units in the same direction, as the sign "+" of the variable indicates a positive relationship between the two.

Therefore, investors in Romania tend to be oriented towards efficiency and resources. But one problem remains the negative issues related to improving the investment environment. Although progress has been made, some problems still remain.

## Conclusions

One solution for generating FDI would be public-private partnership. Countries in Central and Eastern Europe increasingly resort to such partnerships. Examples come from Poland, where Motorway and Express Ways Development Program handles the construction of highways, Latvia, where there is a partnership for the international corridor for Baltic and ring road of the city Riga, Daugava River Crossing, or Bulgaria, where international airports Varna and Burgas have been rehabilitated through such partnerships. Steps in this direction exist. In Romania was established a department for coordinating public-private partnerships, namely the Department for Foreign Investment Projects and Infrastructure (http://www.dpiis.ro/parteneriat-public-privat-27).

In recent years, Romania has made some progress on the investment environment, therefore, compared to other countries, it has some advantages, such as openness to the European market (500 million consumers), promising growth rates compared to the European average, valuable human capital, highly skilled workforce at competitive prices (good knowledge of foreign languages, technology, IT,

engineering, etc.), similar legislation with the EU, active foreign trade. More and more investors are attracted to the renewable energy sector. Several privatizations are planned in the next period, encouraging investors around the world to look to Romania. This positive development can be stimulated by appropriate economic strategies and actions for the reduction of investment minuses.

## References

Alfaro, L. (2003). „Foreign direct investment and growth: Does the sector matter?", Harvard Business School

Barrell, R., Holland, D. (2000). "Foreign direct investment and enterprises restructuring in Central Europe", *Economic of Transition*, vol. 8, no. 2

Borensytein, E., De Gregorio, J., Lee, J-W. (1998). „How does foreign direct investment affect economic growth?", *Journal of International Economics*, no. 45, pp. 115-135

Carstensen, K., Toubal, F. (2004). "Foreign direct investment in Central and Eastern European countries: a dynamic panel analaysis", *Journal f Comparative Economics*, vol. 32, no. 1

Demekas, D.G., Horvath, B., Ribokova, E., Wu, Y. (2005). "Foreign Direct Investment in Southeastern Europe: How (and How Much) Can Policies Help?", *IMF Working Paper*, European Departament

Hayakawa, K., Lee, H-H, Park, D. (2010). "The role of home and host country characteristics in FDI: Firm level evidence from Japan, Korea and Taiwan", Institute of Developing Economies, *Discussion paper* no. 3

Helpman, E, Melitz, M.J., Yeaple, S.R. (2004). „Exports versus FDI with heterogeneous firm", The American Economic Review, vol. 94, no.1, pp. 300-316

Lansbury, M., Pain, N., Smidkova, K. (1996). "Foreign direct investment in Central Europe since 1990: An Econometric Study", National Institute Economic Review

Romer, P. (1993). „Idea gaps and object gaps in economic development", *Journal of Monetary economics*, no. 32, pp. 543-573

Roubini, N., Wachtel, P. (1998). "Current account sustainability in transition economies", National Bureau of Economic Research

Tintin, C. (2013). „The determinants of foreign direct investment inflows in the Central and Eastern European Countries: The importance of institutions", *Comunist and post-comunist Studies,* vol. 46, issue 2, pp. 287-298

Trașcă, D.L., Aceleanu, M.I., Sahlian, D. (2013). „Eficienţa în plan teritorial a politicii de coeziune în România", *Economie teoretică şi aplicată*, vol. XX (2013), no. 1(578), pp. 64-74

Yeaple, St. (2009). "Form heterogeneity and the structure of U.S. multinational activity: an empirical analaysis", National Bureau of Economic Research, *Working Paper 14071*

FMI (2007). World Economic Outlook

OECD (2007). "Globalization and regional economies. Can OECD regions compete in global industries?" OECD, Paris

http://dpiis.ro/motive-de-a-investi-61/

http://www.onrc.ro/statistici/is_iulie_2012.pdf

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# Interrelationship of biases: effect investment decisions ultimately

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**Abstract.** *The purpose of this study is to examine if investors of Islamabad Stock Exchange are indicating tendencies of irrational behavior when exposed to certain psychological dilemmas related to the financial world and what are interrelationships among these dilemmas, This study deals with three dilemmas i.e. self-attribution bias, overconfidence bias and overoptimism bias. The main purpose of the study is to empirically prove the relationship among the biases and their effect on the rational decision making of an investor. For this study quantitative method is used and a survey is conducted. For measuring the behavioral impact on decision making, Structural Equation Modeling is used on the collected empirical data to obtain the results. The findings of this study can be useful for individual investors, financial brokers, financial manager and other financial decision makers to improve their cognitive thinking process and make more rational decisions.*

**Keywords:** behavioral finance, self-attribution bias, overconfidence, overoptimism, rational decision making.

**JEL Classification:** D23, F27, G11, M10.
**REL Classification:** 11B.

## 1. Introduction

Behavioral finance is somewhat an emerging but rapidly growing area of finance, which study people's economic decision-making behavior and the theory of cognitive psychology combined with the interpretation of the traditional finance and economics and. The basic presumption in behavioral finance is that, data structure combining with aspects of the market sector members influences the investment choices of investors and market results. The reasoning mechanisms don't function as computer rather; a person's mind frequently operates data utilizing sentimental channels or alternatives. Standard finance expects that finance sectors members, foundations, and even markets are discerning or rational. Those individuals make rational decisions and increase their wealth. Any individual who makes irrational decisions will suffer from poor results. Continuously with entry of time people figure out how to settle on balanced or rational choices or they retreat the business and any oversights that market members make are not corresponded with one another; hence the lapses don't have the quality to influence market costs. The efficient market hypothesis by (Fama, 1970) declares that the reasonable business sector investors have seized all known information and probabilities concerning doubt about what's to come into current costs. So no irrational decision may take place on their end and no irregularities can be found in efficient market. But one cannot challenge that there are no anomalies occurring in market. And behavioral Finance is the dimension of finance which conceives psychology related theories to elaborate the stock market anomalies.

According to (Shefrin, 2007) bias is nothing else yet the inclination towards failure. Bias is tendency to make decisions while the decision maker is already being subjected to an underlying credence or belief. There are so many biases in human psychology. This research focus on following three: (1) Self attribution; (2) Overconfidence and (3) Overoptimism. These biases lay impact on individuals in such a way that they frequently deed on an obviously silly way, routinely disregard conventional ideas of risk aversion, and make foreseeable lapses in their conjectures and judgments. These biases play their part in shaping individual's choices, financial decisions in corporations and financial markets. Unreasonable choices hamper the investor's wealth and the execution of companies and additionally the productivity of business sector. Scholars have identified so many biases. (Kahnemann and Tversky, 1979) wrote a paper in which they stated different states of minds that may impact the investor's decision making process; they are risk aversion, regret aversion and self attribution and the locus of control. They based their study work on prospect theory.

Self-attribution bias make Individuals believe that their triumph is because of their prevalent abilities and skill set and they are alone responsible for their success and their failure is not their fault. (Hastorf et al., 1970) proved that individuals give credit of the good results on superior skills they think they possess, while blame different causes for their failures. In a similar study, (Gervais and Odean, 2001) studied that. When an investor gets favorable outcomes he/she credits this success to their personal abilities and thus overestimates their abilities and this overestimation leads to another bias called overconfidence.

Overconfidence is a bias which reflects the state of mind in which an individual overestimates his/her abilities or skill to perform a particular task. In their study of Overconfidence bias (Barber and Odean, 2001) found that it effects the rational decision making of investors and will lead the investor to trade in more risky security. (Gervais and Odean, 2001) studied that both overconfidence and overoptimism are personality traits which effect the decision making of an individual and that the overconfidence reinforces the overoptimism.

Overoptimism is the overestimation of the frequency of desired favorable results and underestimation of less favorable results (Shefrin, 2007). This overoptimism or excessive optimism bias is present in variety of fields of finance i.e. (Meinert, 1991) found that the main reason behind the debt problems is the overoptimism of corporate managers. Meinert also proved that every new product in market is embroidered with excessive optimism about its success. (Golden et al., 1994) studied the projection is effect with overoptimism bias and it is not surprising because most of companies are enthusiastic while launching new item, same can be applied on trading of IPO's. And overoptimism especially increases there, where the survival of individual or company is much dependent on favorable outcome. Investors are also influenced by overoptimism bias as it was studied by (Brown and Cliff, 2005) that the investor feelings do influence their ability to value a security. Overconfidence and overoptimism are a bit similar in nature, but they are not the same. An overoptimistic individual might not be overconfident about his/her abilities but yet optimistic about the occurrence of a desired positive outcome of their actions, while an overconfident person is sure about his/her ability, or the outcome of the event. So an overconfident individual is likely to be overoptimistic as well because he/she overestimate their abilities and they think that they have made the best decision which will generate them maximum positive results, thus they become overoptimistic about the outcome as well. So an overconfident individual is highly likely to be overoptimistic while an overoptimistic individual may or may not be overconfident (Baumeiste et al., 1989).

### 1.2. Problem identification

Peter L. Bernstein (2009) studied the evidence that shows persistent signs regarding illogicality, instability or inability of the individual to reach on rational choices and decision meanwhile they encounter uncertain situation. Behavioral finance answers the following question. "Why individuals commit systematic mistakes" or how the psychological phenomenon affect their ability to make decisions.

This current study has foundation in common biases which cause market anomalies and which affect the investment decisions and finding relationship in the biases so suggesting measures to overcome those mental shortcomings that allow irrational and suboptimal decision making. So in this study the identification of the most important biases that affect the human decision making and their interrelationships are empirically proved and further their individual and compound impact on the decision making are established. The investors, who are exposed from psychological phenomenon, will make irrational decisions and will suffer from suboptimal results. This research incorporates some of these phenomenons (biases) and also determines the relationship among these biases.

### 1.3. Problem statement

It is established that self-attribution, overconfidence and overoptimism effect rational Decision making. But theory says that there is a relationship among these biases (self-attribution, overconfidence and overoptimism) and there is not much research on this type of relationship. Here literature is lacking to give evidence on seminal reasons. So how these biases (self-attribution, overconfidence and overoptimism) are related to each other and how they affect rational decision making?

### 1.4. Research questions

The research questions for the study are:

1) Is there a relationship among self-attribution bias and overconfidence?
2) Is there a relationship between overconfidence and overoptimism?
3) How self attribution impact Rational Decision making?
4) How overconfidence impact Rational Decision making?
5) How overoptimism impact Rational Decision making?

### 1.5. Objectives of research

The purpose of research is to study that if investors show propensities of unreasonable conduct when they are presented to specific mental situations. To recognize the extent to which Pakistani stock exchange investors are showing irrational behavior in their investment decisions is main objective of the study.

Measuring the association among the biases and proving them that they are the causes of irrational decision making. In nutshell the main objectives of the study are:

- To find most important biases related to investors decision making.
- To empirically study the relationships among the most important biases.
- To find how each of the bias is affecting the investor's decision making.

### 1.6. Significance of research

A very few studies has been conducted in Pakistan on the financial misery and in the field of behavioral finance. This study can be used in understanding of how these financial decisions were made and what were the possible anomalies attached to these decisions. So through the results of the study rectifying the decisions and formulating the policies for future decisions can be generated. Stockholders and investors can use the findings of the study not only to manage the most suitable portfolio for them, but also able to choice the right companies for their stocks without exposing to biases and screening out the companies that are not suitable for their wealth maximization.

Similarly financial brokers can also use it to assess their customer that how much the customers are exposed to biases and how to treat them. So the study can help improve financial situation by rightfully acknowledging the risky situation and timely taking measures to cope with this situation. Existing work in this study has emphasized on identification of different heuristics and biases and their impact on the investment decision making. This research not only find the impact of such biases on investors decision making but also try to find the relationship among the biases and suggesting the key reasons why these exists and then suggesting measures to overcome this. All the study will be based on empirical evidence.

## 2. Literature review

### 2.1. Self-attribution bias

When people relate their success with their own abilities and skills and hold external forces or bad luck for their failures is self-attribution bias (Shefrin, 2007: p. 101). (Gervais and Odean, 2001) argued that people judge their skills not through self-examination but by assessing their accomplishments and failures. People mostly take too much credit for their own achievements, they also found that self-attribution bias affects the impression of people regarding their abilities and diverts them from learning from past successes. The motivational process e.g. self-enhancement and self-preservation combines with cognitive factors e.g. self-esteem and locus of control creates self-attribution bias. Chief operation officers (CEOs) suffering self-attribution bias credit the success of company

because of their abilities, while failures are attributed to economic situation, CEOs suffering from self-attribution bias tend to overestimate their capabilities and therefore invest in such projects which are risky (Malmendier and Tate, 2005).

### 2.2. Overconfidence bias

Overconfidence bias is failure to recognize the boundaries of one's knowledge (Russo and Schoemaker, 1992). The factors such as self-commitment to the project and self-declaration of proficiency are the causes of overconfidence in an investor. When individuals fail to comprehend the dubiety of their abilities fully, overconfidence tends to increase (Kahneman and Tversky, 1979). Psychological researchers have found how overconfidence bias affects the behavior of individuals. The decisions related to uncertain events are the ones which possess element of overconfidence.

Overconfidence bias appears in the form of excessive optimism and better than average effect. Overconfidence bias can be very harmful on financial decisions; In a resembling research (Odean, 1998) proved that the investors with overconfidence will over-value their knowledge, thus they will invest actively. But investing actively does not guarantee favorable outcomes. (Barber and Odean, 2001) studied in their study that the investors who trade frequently earn much less profit then those investors who trade in frequently, thus overconfidence bias is dangerous for those type of investors.

### 2.3. Over optimism bias

Over optimism is the overestimation of positive results and underestimation of negative results (Shefrin, 2007). People are overoptimistic when they believe that they will not be exposed to future events and things will not go beyond their control and people also think that there is high probability that positive event will happen to them and negative events will happen to others (Weinstein, 1980). In further notification he asserted that people have tendency to believe that it is less likely that they will suffer from an undesired situation then the others. He studied that overoptimism bias is in many domains and age groups. Individuals are overoptimistic before an event e.g. people before start of their holidays were expecting more fun and enjoyment but during that same holidays they express less enjoyment. Individuals are overoptimistic when asked about to anticipate their estimation of their future experiences. Overoptimism is also present in business environment. Entrepreneurs are extremely optimistic regarding their future outcomes when compare to investors. The overoptimism bias particularly affects the financial decision making, the main cause of debt problems today are due to overoptimism of financial managers (Meinert, 1991). He gave most emphasis on the literature identifying behavioral decision-making attributes that are likely to have systematic effects on financial market behavior. He said even though the

field is new and evolving, a number of potential psychological decision attributes have been identified. These include the following: Decision makers' preferences tend to be multifaceted, open to change, and often formed only during the decision process itself.

Decision makers appear to be adaptive, in the sense that the nature of the decision and the environment in which the decision is made contribute to their selection of a decision process or technique. Decision makers seek satisfactory, rather than optimal, solutions. (Olsen, 1998) through empirical evidence suggests that these contribute to the following investment-related characteristics: Excessive stock-price volatility and bubbles in prices, Follow-the-leader or herding behavior among investors, misestimating of the risk of loss, Selling winning investments too early and selling losing investments too late, Differing preferences among investors for cash dividends, Belief in the value of time diversification (that risk diminishes with time), Popular investments earning poorer than desired returns, Investors mistaking "good" companies for "good" investments, Asset prices appearing to over- or under react to new market information, Individual investors holding poorly diversified portfolios, and a superior short-run and inferior long-run performance of initial public offerings (Olsen, 1998).As a result of poorly diversified portfolio the investor suffers loses both in short-term and long-term time periods. This happens because the investor suffers from different biases and select portfolio which they think are profitable.

### 2.4. Self-attribution and overconfidence relationship

Self-attribution bias also builds up an individual's overconfidence (Miller and Ross, 1975); (Wolosin and Till, 1973) and (Schneider et al., 1979). Individual exposed to self-attribution bias think that they have more abilities then average, known as "Batter then average effect" (Taylor and Brown, 1988); (Svenson, 1981). As self-attribution enhances overconfidence, so the subjects who suffer from this bias will be overconfident in their decisions and judgments. Self-attribution bias affects the ability of a person to estimate his/her abilities and also affects the learning from past performances of that person to estimate his/her abilities and also affects the learning from past performances of that person. (Gervais and Odean, 2001) worked on the effects of previous performances of the investors on their behavior, and found that success strengthens the overconfidence. When an investor is successful, he/she credit this success with their own capabilities and skills and firms their beliefs regarding their ability too much, as a result they become overconfident. It was found that People suffering from self-attribution bias become more overconfident after a success and it affects the conception about own capabilities as it hinders the evaluation of past performance, this leads to overconfidence (Seppälä, 2009).

In a research conducted on managers it was found that managers who succeed may become overconfident because of a self-attribution bias, (Malmendier and Tate, 2005) write that they had found that for overconfidence, CEO's overestimation of skills and self-attribution accounts for. In investment agents (brokers) biased self-attribution was found to bringing excessive optimism. When confronted with uncertainty investors tend to be increasing biased self-attribution, which ultimately induce overconfidence in them (Yosef and Kumar, 2012). It was found that individuals become more overconfident instead of going for self-assessment when affected by self-attribution bias (Cova et al., 2001).

(Tversky, 1995) studied that overconfidence generates from Phenomena like self-enhancement, locus of control and carelessness of predictability correctness, all these are the roots of overconfidence in an individual. Investors are overconfident about the events which they hope will generate positive outcomes and will personify them (Weinstein and Klein, 2002); (Weinstein, 1980). So self-enhancement triggers overconfidence in investors

### 2.5. Overconfidence and over optimism relationship

The overconfidence and overoptimism quite resemble biases, yet are not the same. People with overconfidence exaggerate their abilities and probability of favorable results, while people with overoptimism might not exaggerate their abilities but they diffidently exaggerate the probability of favorable results (Baumeister et al., 1989).

A person who does not overestimate his/her abilities, but believes in a desired positive result from certain scenario, is overoptimistic. The common thing about overconfidence and overoptimism is that in both bias a person is seeking positive outcomes from his/her decisions. So being overconfident makes a person over optimistic as well, but it is not necessary that an over optimistic person is overconfident. The overestimation of the abilities of one person and outcome of a specific project is overconfidence while the overestimation of only the desired outcome of a specific project it overoptimism (Gervais, et al., 2002).

(Hirshleifer, 2001) outlines the connection between presumptuousness and self-attribution inclination: Overconfidence and predisposition self-attribution are static and alert partners; self attribution causes people to figure out how to be presumptuous as opposed to uniting to a faultless self-evaluation. Notwithstanding its potential significance, there is minimal experimental proof recording those self-attribution matters to managerial choices. There are so many heuristics and biases that have been identified by the researchers that cause for the anomalies occurring in the markets.

(Shiller, 2005), in his research he worked over prospect theory, regret and cognitive dissonance, anchoring, mental compartments, overconfidence, over- and under reaction, representativeness heuristic, the disjunction effect, gambling behavior and speculation, perceived irrelevance of history, magical thinking, quasi magical thinking, attention anomalies, the availability heuristic, culture and social contagion, and global culture.

From above researchers' literature it can be inferred quiet easily that self-attribution, overconfidence and overoptimism leads investors to exaggerate and overestimate their knowledge and then they such decisions that not only are suboptimal but also leads to severe costs and also it shows that how self-attribution becomes root cause for overconfidence bias, and overconfidence becomes seminal cause of overoptimism thus one bias leading to another bias. The literature review also identifies the research gap that the seminal cause is present among the biases and this is the main purpose of the study.

## 2.6. Development of Hypotheses

$H_1$: there is a positive relationship between self-attribution bias and overconfidence.

$H_2$: There is positive relationship between overconfidence and overoptimism.

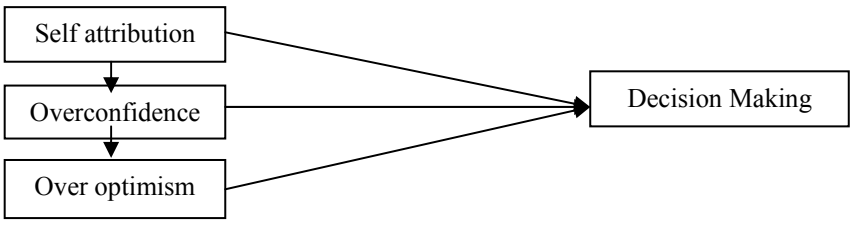
H3: There is negative relationship between self attribution and Rational Decision making.

H4: There is negative relationship between overconfidence and Rational Decision making.

H5: There is negative relationship between overoptimism and Rational Decision making.

## 2.7. Conceptual model of the study

**Figure 2.1**



## 3. Material and Methods

### 3.1. Questionnaire Design

The questionnaire is designed in a way to inspect how individual investors respond to mental problems introduced to them. To determine this we presented the investors with set of questions related to the mental problems, whole questionnaire was joined by picked concepts, and questions were organized in such manner that particular conducts could follow from given responses. The way of inquiries was paired with immediate and circuitous. So some questions were direct, giving regulates replies; meanwhile some questions were solicited from by implication, with sample the scale evaluates. The questions were related to self-attribution bias, overconfidence bias and overoptimism bias and the final portion of the questionnaire was to assess the performance of the investors, that how successful they are in their decision making. This approach was imperative since we are contemplating mental propensities. We can't pose query like this, "Are you impacted from overconfidence?". Questionnaire used for the study are based on the five scale likert. Questionnaires have been taken from existing literature and books (Verheul and Carree, 2007); (Hoffman et al., 2010) and (Seppälä, 2009). The primary purpose of these questionnaires is to detect whether person is suffering from that specific bias or not. Most of the questions are like problems to whom respondent have to give responses. A value will be assign to the responses then these will be used in final statistical technique to prove the model.

### 3.2. Data

The total sum of the member is called population. The sum number of the selected person's of chosen from population is called as population size. In this research the population incorporates investors of Islamabad stock exchange. It is a choice of a component of an aggregate population with the perspective to find data about the entire and chose part which is utilized to figure out the aspects of the entire population as distinguished as sample. For the accumulation of information the testing systems are utilized that have distinctive preferences over statistics. Case in point, this information accumulation strategy is less expensive; give the expedient approach of information gathering and more stupendous exactness. In this research, purposive sampling method has been utilized for the accumulation of information. In this information gathering procedure, a poll involving 24 questions was used than directly went to the Islamabad stock exchange and brokerage houses of twin urban communities Islamabad and Rawalpindi to get the quantitative information on inquiries from investors.

### 3.2.1. Sample size

Sample size of the investors from Islamabad stock exchange was of 220. Since there are 24 questions in the questionnaire so minimum sample size should be 5×24 =120 (Krejcie, 1970). The questionnaire was distributed among the investors through brokers.

### 3.2.2. Data collection

By visiting Islamabad Stock Exchange and meeting with brokers and make request to give access to the actual investors whom have accounts with them. Questionnaires were distributed among the investors and filled questionnaires were received.

### 3.3. Data analysis tool

Structural equation modeling is used to analyze the hypothesis.

$$\boldsymbol{OC_i = \sum_{i=1}^{n} \beta_i SA_i + \varepsilon}$$

$$\boldsymbol{OO_i = \sum_{i=1}^{n} \beta_i OC_i + \varepsilon}$$

$$\boldsymbol{DM_i = \sum_{i=1}^{n} \beta_i SA_i + \sum_{i=1}^{n} \beta_i OC_i + \sum_{i=1}^{n} \beta_i OO_i + \varepsilon}$$

### 3.4. Analysis of data

Editing of survey response for detecting and improving errors and omissions was performed to achieve most favorable standards of data quality. Primarily data was entered in SPSS 18 version. In this research Cornbach's alpha is utilized to calculate the reliability and to calculate validity CFA was utilized on the Questionnaire, and then SEM is used to analyze the final model. Firstly, the reliability test was utilized to check consistency of investor’s reactions.

According to (Hair, 1998) Reliability is the level of consistency around the numerous estimations of the variable, while reliability demonstrates compactness in the discoveries of examination study. The best and generally acknowledged register of reliability is inward consistency. And this reliability is obtained by coefficient alpha also known as Cronbach’s alpha. For figuring consistency estimations around different variables, reliability test was run to determine it.

### 3.5. Pilot study

Keeping in mind the end goal to assess the different psychometric qualities of the instruments pilot study was performed on the specimen of 60 investors. The purpose of conducting the pilot study was to determine the validity and reliability of the questionnaire, and after that this questionnaire could be used for the final study.

### 3.6. Sample of the study

The following table represents the sample of the pilot study:

**Table 3.1**

| Groups | Subgroups | F | % | Total |
|---|---|---|---|---|
| Gender | Male | 60 | 100% | 60 |
| | Female | 0 | 0% | |
| Qualification | Intermediate | 1 | 1.7% | 60 |
| | Bachelor | 36 | 60% | |
| | Master | 23 | 38.3% | |
| | M.phl | 0 | 0% | |
| | PhD | 0 | 0% | |
| | Total | 60 | 100% | |
| Age | 18-25 | 2 | 3.3% | 60 |
| | 25-32 | 17 | 28.6% | |
| | 32-39 | 22 | 36.6% | |
| | 39-46 | 11 | 18.3% | |
| | 46-52 | 5 | 8.3% | |
| | 52-59 | 3 | 5% | |
| | Above 59 | 0 | 0% | |
| | Total | 60 | 100% | |
| Experience | < 1 year | 3 | 5% | 60 |
| | 1-2 year | 14 | 23.3% | |
| | 2-3 year | 35 | 58.3% | |
| | 3-4 year | 6 | 10% | |
| | >4 year | 2 | 3.3% | |
| | Total | 60 | 100% | |

### 3.7. Confirmatory factor analysis

The Confirmatory factor analysis (CFA) directed in survey to build validity and legitimacy. The validity of the constructs of self attribution bias, overconfidence and overoptimism was determined by using CFA analysis. And following validity properties are obtained $\chi 2$ (chi square), $\chi 2/df$, AGFI (Adjusted goodness of fit), TLI (Tucker-Lewis coefficient)also known as non normed fit index , df (degree of freedom), p-value, GFI (goodness of fit), CFI (comparative fit index) and RMSEA (root mean square error of approximation).

As suggested by (Bentler and Hu, 1991) the root mean square error of approximation must be equal or below 0.80 and comparative fit index, Tucker-Lewis coefficient, goodness of fit should be around 0.90 or above it while χ2/df should be in between 5 to 3 scale for the model to be fit and accurate. Confirmatory Factor Analysis was applied on the 13 constructs of self-attribution, 5 constructs of overconfidence, 3 constructs of overoptimism and 5 constructs of decision making.

**Figure 3.1**

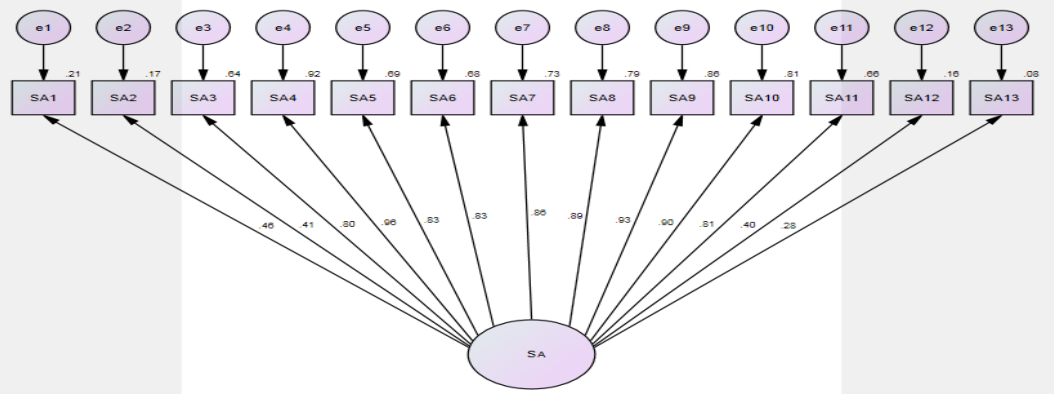



**Table 3.2.** *CFA of Self-attribution*

| Elements | Estimates | Elements | Estimates |
|---|---|---|---|
| χ2 | 138.418 | Df | 65 |
| χ2/df | 2.130 | p-value | .000 |
| AGFI | .650 | GFI | .750 |
| TLI | .870 | CFI | .892 |
| RMSEA | .98 | | |

The Confirmatory factor analysis (CFA) of self attribution shows a peripheral fit. The quality of χ2/df (Chi-square/df) is 2.130 that are less than 3 and according to (Kline, 1998) χ2/df equal or less than 3 is acceptable while (Ullman, 2001) suggested that χ2/df equal or less 2 indicates moderate fit but less than 1 is not acceptable fit. The value of AGFI (adjusted goodness of fit index) is 0.650 and GFI (goodness of fit index) is 0.750 which is also indicating a moderate fit, the value of AGFI and GFI close to 0.90 or above is considered good fit. The values of CFI (comparative fit index) and TLI (Tucker-Lewis coefficient) are 0.892 and 0.870 which are just below the benchmark of 0.90. The value of RMSEA (root-mean-square error of approximation) is 0.98 which is too high for the model to be good fit. So all the values are indicating that model for validity of self attribution is a moderate fit.

The estimated values of the constructs of self attribution bias are 0.45, 0.41, 0.80, 0.96, 0.83, 0.83 0.86, 0.89, 0.90, 0.90, 0.81, 0.40, and 0.28. The greater part of the previously stated qualities are above the commendable level of 0.3, from this henceforth they are recognized exceptional with p-regard < 0.001.

The $R^2$ qualities for SA(1,2,3,4,5,6,7,8,9,10,11,12,13) independently, these values show the rate of assortment in each point that is clarified by the components of SA. From the impacts it could be discerned that Sa4 and is the best markers for this fabricate, with the most surprising institutionalized examinations of 0.96 and the most decreased marker is Sa13 with the worth 0.28. So Sa13 could be discarded from final survey. Since all other question's values are to a good

degree close to the benchmarked qualities so the model could be appropriated.

**Figure 3.2**

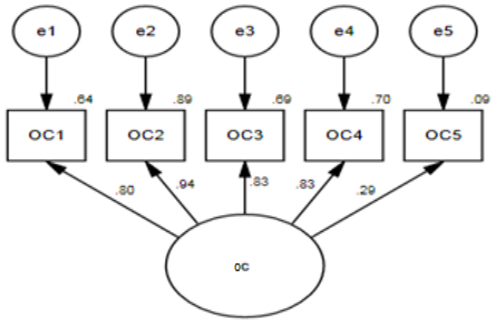



**Table 3.3.** *CFA of overconfidence*

| Elements | Estimates | Elements | Estimates |
|---|---|---|---|
| χ2 | 11.301 | Df | 5 |
| χ2/df | 2.260 | p-value | .046 |
| AGFI | .791 | GFI | .930 |
| TLI | .928 | CFI | .964 |
| RMSEA | .97 | | |

The Confirmatory factor analysis (CFA) of overconfidence shows a peripheral fit. The quality of χ2/df (Chi-square/df) is 2.260, that is less than 3 and according to (Kline, 1998) χ2/df equal or less than 3 is acceptable while (Ullman, 2001) suggested that χ2/df equal or less 2 indicates moderate fit but less than 1 is not acceptable fit. The value of AGFI (adjusted goodness of fit index) is .791 and GFI (goodness of fit index) is .930 which is also indicating a moderate fit, the value of GFI is above the bench mark of .90 or above so it is considered good fit. The values of CFI (comparative fit index) and TLI (Tucker-Lewis coefficient) are 0.964 and 0.928 which are just above the benchmark of .90. The value of RMSEA (root-mean-square error of approximation) is 0.97 which is too high for the model

to be very good fit. So all the values are indicating that model for validity of overconfidence is moderate fit.

The estimated values of the constructs of overconfidence bias are 0.80, 0.94, 0.83, 0.83 and 0.29. The greater part of the previously stated qualities are above the commendable level of 0.3, from this henceforth they are recognized exceptional with p-regard < 0.001.

The $R^2$ qualities for OC1, OC2, OC3, OC4 and OC5 independently, these values show the rate of assortment in each point that is clarified by the component of OC. From the impacts it could be discerned that OC2 and is the best markers for this fabricate, with the most surprising institutionalized examinations of 0.94 and the most decreased marker is OC5 with the worth 0.29 which is below to the benchmarks of 0.30. So OC5 could be discarded from final survey and was not included in the final questionnaire used for the collection of data for the final study. Since all other question's values are to a good degree close to the benchmarked qualities so the model could be appropriated.

**Figure 3.3**

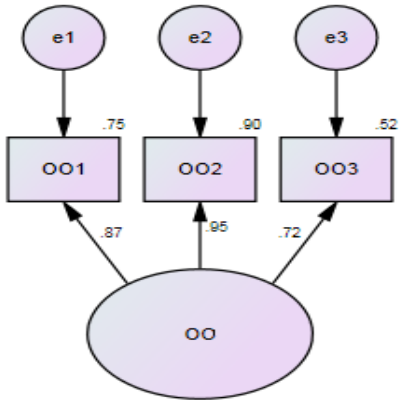



**Table 3.4.** *CFA of overoptimism*

| Elements | Estimates | Elements | Estimates |
|---|---|---|---|
| χ2 | 1.496 | Df | 1 |
| χ2/df | 1.496 | p-value | .221 |
| AGFI | .901 | GFI | .984 |
| TLI | .983 | CFI | .994 |
| RMSEA | .092 | | |

The Confirmatory factor analysis (CFA) of overoptimism shows a peripheral fit. The quality of χ2/df (Chi-square/df) is 1.496, that is less than 2 and according to (Kline, 1998) χ2/df equal or less than 3 is acceptable while (Ullman, 2001) suggested that χ2/df equal or less 2 indicates moderate fit but less than 1 is not

acceptable fit. The value of AGFI (adjusted goodness of fit index) is 0.901 and GFI (goodness of fit index) is 0.984 which is also indicating a good fit, the value of GFI and AGFI is above the bench mark of 0.90 or above so it is considered good fit. The values of CFI (comparative fit index) and TLI (Tucker-Lewis coefficient) are 0.983 and 0.994 which are just above the benchmark of .90.

The value of RMSEA (root-mean-square error of approximation) is 0.92, which is too high for the model to be very good fit; the value of RMSEA should be below 0.80 to be acceptable the more closely it gets to 0.01 the more suitable the model is. So all the values are indicating that model for validity of overconfidence is moderate fit. The estimated values of the constructs of overoptimism bias are 0.87, 0.95 and 0.72. The greater part of the previously stated qualities are above the commendable level of 0.3, from this henceforth they are recognized exceptional with p-regard < 0.001.

The $R^2$ values for OO1, OO2 and OO3 independently, these values show the rate of assortment in each point that is clarified by the component OO. From the impacts it could be discerned that OO2 and is the best markers for this fabricate, with the most surprising institutionalized examinations of 0.95 which is a very good value of the validity for an instrument and the most decreased marker is OO3 with the worth 0.72.

Since all the values are very close to the benchmarked values so the model can be accepted and no question will be removed from final study and all the questions of overoptimism bias will remain in the final questioner used for the collection of data for the final study. So all question's values are to a good degree close to the benchmarked qualities so the model is appropriate.

**Figure 3.4**

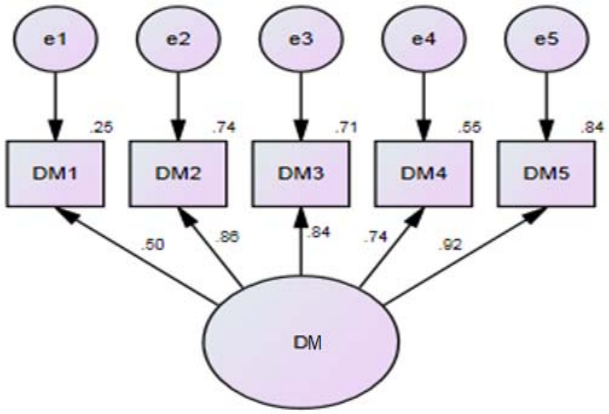


**Table 3.5.** *CFA of Decision Making*

| Elements | Estimates | Elements | Estimates |
|---|---|---|---|
| χ2 | 27.271 | Df | 5 |
| χ2/df | 2.454 | p-value | .000 |
| AGFI | .543 | GFI | .848 |
| TLI | .766 | CFI | .883 |
| RMSEA | .275 | | |

The Confirmatory factor analysis (CFA) of Decision Making shows a peripheral fit. The value of χ2/df (Chi-square/df) is 2.454, that is more than 2 and according to (Kline, 1998) χ2/df equal or less than 3 is acceptable while (Ullman, 2001) suggested that χ2/df equal or less 2 indicates moderate fit but less than 1 is not acceptable fit. The value of AGFI (adjusted goodness of fit index) is 0.543 and GFI (goodness of fit index) is 0.848 which is also indicating a moderate fit, the value of GFI and AGFI is below the bench mark of 0.90 or above so it is moderate good fit. The values of CFI (comparative fit index) and TLI (Tucker-Lewis coefficient) are 0.883 and 0.766 which are below the benchmark of 0.90.

The value of RMSEA is (root-mean-square error of approximation) 0.275, which is very good for the model fit. So all the values are indicating that model for validity of Decision making is moderate fit. The estimated values of the constructs of Decision making are 0.50, 0.86, 0.84, 0.74 and 0.92. The greater part of the previously stated qualities are above the commendable level of 0.3, from this henceforth they are recognized exceptional with p-regard < 0.001.

The $R^2$ qualities for DM1, DM2, DM3, DM4 and DM5 independently, these values show the rate of assortment in each point that is clarified by the component of DM. From the impacts it could be discerned that DM5 and is the best markers for this fabricate, with the most surprising institutionalized examinations of 0.92 and the most decreased marker is DM with the worth 0.72. Since all the values are very close to the benchmarked values so the model can be accepted and no question will be removed from final study.

So all other the qualities are to a good degree close to the benchmarked qualities so the model is appropriate for conducting the final study. The confirmatory factor analysis of all the variables is showing that the questionnaire is valid and can be used for the data collection of the final study. Only two questions are removed from the final study and remaining is included in questionnaire.

### 3.8. Reliability analysis (N = 60)

Table 3.6 depicts reliability of instruments of the study indicates the scale of all the items are within the satisfactory parameters. Estimates of Cronbach's alpha for each item are above the 0.80 which indicates good reliability of the questionnaire.

The Cronbach's alpha of Self attribution is 0.926, overconfidence is 0.856, overoptimism is 0.852 and Decision making is 0.879. For the 13 items of self-attribution, 5 items of overconfidence, 3 items of overoptimism and 5 items of decision making.

**Table 3.6**

| Scale | No. of Items | Value of Cronbach's alpha |
|---|---|---|
| Self attribution | 13 | .926 |
| Overconfidence | 05 | .856 |
| Overoptimism | 03 | .852 |
| Decision making | 05 | .879 |

The results obtained from The Confirmatory factor analysis (CFA) and Cronbach's alpha implemented on the pilot study suggest that the model is appropriate and fit for the conduction of final study. So final study is conducted using sample size of 220 investors from Islamabad stock exchange, next chapter includes the SEM test and its results on final study.

## 4. Results and discussion

### 4.1. Results

The following table represents the sample of the study:

**Table 4.1**

| Groups | Subgroups | F | % | Sum |
|---|---|---|---|---|
| Gender | Male | 217 | 98.6% | 220 |
| | Female | 3 | 1.4% | |
| Qualification | Intermediate | 7 | 3.18% | 220 |
| | Bachelor | 84 | 38.19% | |
| | Master | 105 | 47.71% | |
| | M.phl | 19 | 8.64% | |
| | PhD | 5 | 2.28% | |
| | Total | 220 | 100% | |
| Age | 18-25 | 12 | 5.5% | 220 |
| | 25-32 | 69 | 31.3% | |
| | 32-39 | 76 | 34.5% | |
| | 39-46 | 24 | 10.9% | |
| | 46-52 | 18 | 8.2% | |
| | 52-59 | 16 | 7.21% | |
| | Above 59 | 5 | 2.3% | |
| | Total | 220 | 100% | |
| Experience | < 1 year | 38 | 17.3% | 220 |
| | 1-2 year | 59 | 26.8% | |
| | 2-3 year | 57 | 25.9% | |
| | 3-4 year | 46 | 20.9% | |
| | >4 year | 20 | 9.1% | |
| | Sum | 220 | 100% | |

**Table 4.2.** *Descriptive statistics*

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| SA | 220 | 1.50 | 4.83 | 3.3781 | .99680 |
| OC | 220 | 1.25 | 4.75 | 3.4955 | 1.20192 |
| OO | 220 | 1.33 | 4.67 | 3.4016 | 1.11338 |
| DM | 220 | 1.40 | 4.60 | 2.5964 | .97811 |
| Valid N | 220 | | | | |

Table 4.2 depict reliability of instruments of the study indicates the scale of all the items are within the satisfactory parameters. Estimate Cronbach's alpha is above the .80 which indicates good reliability.

### 4.1.1. Reliability of final model (N = 220)

**Table 4.3**

| Scale | No. of Items | Value of Cronbach's alpha |
|---|---|---|
| Self attribution | 12 | .929 |
| Overconfidence | 04 | .942 |
| Overoptimism | 03 | .878 |
| Decision making | 05 | .884 |

**Figure 4.1.** *Structural model*

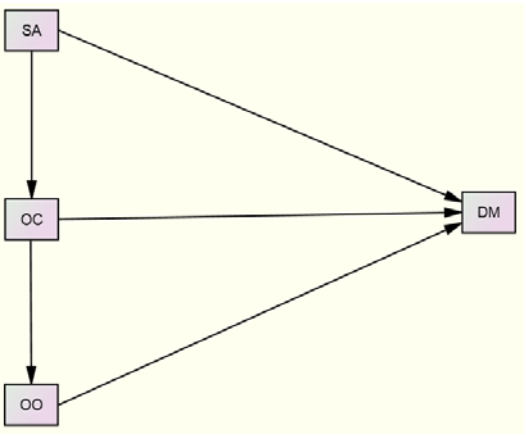



**Figure 4.2.** *Unstandardized estimates*

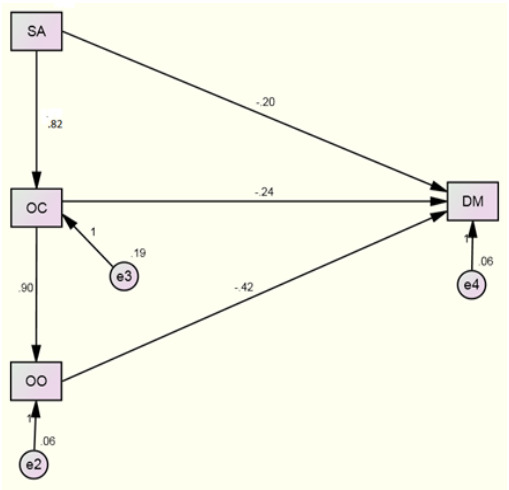
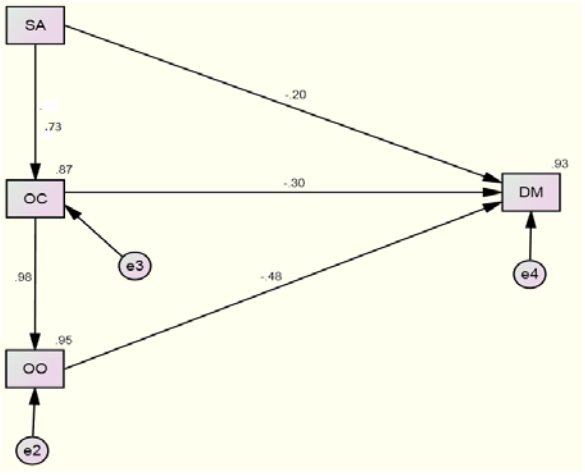


**Figure 4.3.** *Standardized estimates*




## 4.1.2. Statistical results and interpretation:

**Table 4.4**

| | | | Estimate | S.E. | C.R. | P | Result |
|---|---|---|---|---|---|---|---|
| OC | <--- | SA | .822 | .030 | 27.436 | *** | accepted |
| OO | <--- | OC | .904 | .014 | 66.891 | *** | accepted |
| DM | <--- | SA | -.196 | .047 | -4.206 | *** | accepted |
| DM | <--- | OC | -.243 | .075 | -3.250 | .001 | accepted |
| DM | <--- | OO | -.422 | .071 | -5.964 | *** | accepted |

All the probability values are less than 0.05 so all the hypothesis are accepted. The negative values indicate the negative effect as indicated in hypothesis. The (***) indicate that the p-value is less than .001 which shows that all the estimates are significant.

These regression weights are indicating that when self-attribution (SA) bias increases by 1 unit the overconfidence (OC) bias increases by 0.822 units. The positive sign indicates that the increase in self-attribution bias increases the overconfidence bias. Similarly when overconfidence (OC) bias increases by 1 unit the overoptimism (OO) bias increases by .904 units. The positive sign indicates that the increase in overconfidence bias increases the overoptimism bias. The results are in line with the studies of (Gervais and Odean, 2001), **(**Seppälä, 2009), (Choi and Dong, 2008), (Wolosin and Till, 1973). The third regression estimate shows that when self-attribution (SA) bias increases by 1 unit the possibility of making a rational decision (DM) decreases by -0.196 units. The negative sign indicates the inverse relationship among self-attribution bias and rational decision making. The fourth regression estimate shows that when overconfidence (OC) bias increases by 1 unit the possibility of making a rational decision (DM)

decreases by -0.243 units. The negative sign indicates the inverse relationship among overconfidence bias and rational decision making. The fifth regression estimate shows that when overoptimism (OO) bias increases by 1 unit the possibility of making a rational decision (DM) decreases by -0.422 units. The negative sign indicates the inverse relationship among overoptimism bias and rational decision making. Thus all the results support the hypothesis of the study. The results are in line with the findings of (Gervais and Odean, 2001) and (Shefrin, 2007).

### 4.1.3. Correlation Matrix

**Table 4.5**

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 SA | 1 | | | |
| 2 OC | .931** | 1 | | |
| 3 OO | .948** | .976** | 1 | |
| 4 DM | -.933** | -.954** | -.962** | 1 |

The table represents the correlation of all the variables. The correlation is noteworthy at the 0.01 level (2-tailed) ranging from .931 to -.962. It is concluded that SA, OC and OO are found positively correlated and significant while the effects of SA, OC and OO are found negatively correlated with DM. The findings are similar to what (Hastorf et al., 1970), (Seppälä, 2009) and (Choi and Dong, 2008) studied.

## Conclusions

The empirical evidences shows that the proposed hypothesis are correct thus it is proved that the Pakistani Investors of Islamabad Stock exchange who suffer from either of these Biases i.e. self attribution, overconfidence and overoptimism make suboptimal decisions and their outcome is less then what they expect. The findings on self attribution bias show that it negatively affects the rational decision making of investors. The findings are similar to what (Gervais and Odean, 2001), (Seppälä, 2009) and (Choi and Dong, 2008) and found in their study of self attribution bias, that self-attribution bias affects the impression of people regarding their abilities and diverts them from learning from past successes. Self-attribution bias is s significant channel that hinder people to link their successes with their internal forces e.g. personal capabilities, and their nonsuccesses with external forces (e.g. bad luck). Furthermore the evidence shows that the investors who are not exposed or aware of the biases make rational decisions and thus they enjoy more favorable outcome. This evidence also supports the second object of the study, which was to study the interrelationship among these biases. It is examined that the biases are related and if an investor suffer from one bias there is a higher possibility that he/she would eventually

exposed to another bias. This study shows that self attribution will lead to overconfidence. The finding of this research are also in line with the results of (Miller and Ross, 1975), (Shiller, 2005), (Malmendier and Tate, 2005) and (Gervais and Odean, 2001) who measured that self attribution bias induces overconfidence and overconfident investors make suboptimal decisions thus they fail to generate the desired outcomes. While on the other hand the rational investors will make optimal decisions and generate the desired results. So it is established that self attribution motivates overconfidence and overconfidence causes overoptimism in investor behavior, hindering the investor from rational decision making. The findings on overconfidence bias show that it negatively affects the rational decision making of investors. The findings are similar to what (Barber and Odean, 2001) and (Seppälä, 2009).

Overconfidence will also lead to overoptimism, as previously proved by (Weinstein, 1980). Investors, who are overconfident about their success, show inclination towards overoptimism. The findings on overoptimism bias show that it negatively affects the rational decision making of investors. The findings are similar to what (Weinstein, 1980) proved in the studies. These biases individually affect the decision making. But theses biases are dependent to each other. When an investor suffers from self attribution bias it is higher possibility that investor will be exposed to overconfidence and overoptimism. Firstly, self attribution generates overconfident behavior in investors and secondly overconfidence leads to overoptimism. So it is found that investors will become overconfident and overoptimistic when they credit themselves of their success and blame other factors for failures.

### Limitations and recommendations

The limitations include that in this study we took response from the investors and it is known that investors themselves often are unaware of the modern world financial terminologies, although it is tried to minimize the effect of their lack of knowledge on their responses but it may have some effect. The data is collected from Islamabad stock exchange and brokerage house of Islamabad and Rawalpindi, so this data might not be applicable for whole Pakistan as there could be regional influence on other geographical areas. And also the data is dependent on the motives, willingness and consent of each individual and the data might not represent the true feelings of individuals who responded. Another limitation is that all most all of the respondents were male investors and very few female investors were available. So it is recommended that in future researches more female investors are included so the effect of gender could be explored as well.

Behavioral Finance is an exceptionally intriguing area of finance, so it is suggested that have a full in-depth analysis of behavior finance theories before

conducting the research, by keeping in mind that it is not a simple area for research and study. Prescription to future research is that to lead comparable research however attempt in escalation size of the sample. From the study 1 situation is to verify, at how much extent these results might sum up the exploration information on greater citizenry. For managing this situation it is recommend to use 2 conceivable exploration methods, 1: expand size of sample 2: limit exploration in precise setting. Behavioral finance is a vast field; there are hundreds of biases still to be search upon. Since this research concludes that these biases are interrelated with each other so further biases could be added with these biases for research purposes. One thing which could be possible in future that I might be possible to study the effect of biases on female investors, because the majority investors participated in this research are male investors. It would be very interesting aspect because mental psychology in gender also differs. So it will be a unique dimension for further research for Pakistani researchers.

## Implementations

A very few researches have been done on the physiological aspect of financial trouble in Pakistan. Individual can utilized findings of this research help rationalize their decision making. The other financial corporation's can also use it can additionally utilize it for yearly appraisal of fiscal position of the organization and on this premise further choice identified with continuation, end, or recharging of the strategies could be defined. It is found that researchers provided most of the evidence on the individual relationships among the biases, heuristics and irrational behavior and decision making, market anomalies. It was found that there is relationship exists among these biases and heuristics but few scholarly work over it found. We develop the model depicting the relationships among these behavioral aspects and finally proving it through empirical evidence.

So financial advisor, brokers, consultant, and investors themselves can identify the seminal causes of irrationality and can significantly improve or enhance their cognitive activities. As a result they can improve their financial decision making because they are now more aware of biases that they suffer. This study can be an important participation by studding affiliation among biases and how one bias generates another bias. So by the help of this study individuals can identify the biases and how to counter them for example if a broker knows that his investor is suffering from overconfidence bias, the broker could easily conclude that it is self attribution bias which is generating overconfidence in investor, so the broker can take steps to eradicate the self attribution bias and overconfidence bias will automatically be controlled then.

## References


Barber, B. and Odean, T. (2001). "Boys will be boys: Gender, overconfidence, and common stock investment", Quarterly Journal of Economics, vol. 116, pp. 261-292

Baumeister, R.F., Tice, D.M. and Hutton, D. (1989). "Self-Presentational Motivations and Personality Differences in Self-Esteem". DOI: 10.1111/j.1467-6494.1989

Bentler, P.M. and Hu, L. (1991). "Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification", *Psychological Methods,* 3(4), December, pp. 424-453

Bernstein, P.L. (2009). *Against the Gods: The Remarkable Story of Risk,* John Wiley & Sons Inc.

Brown, G., Cliff, M. (2005). "Investor Sentiment and Asset Valuation", *The Journal of Business.* vol. 78, issue 2, Chicago, pp. 405-36

Choi, D. and Dong, L. (2008). *A test of the self-serving attribution bias: evidence from mutual funds*, Hong Kong University of Science and Technology

Coval, J., Hirshleifer, D., Teoh, S.H. (2001). "Self-Deception and Deception in Capital Markets". Austrian Ministry of Science Workshop, Paris, December 7-8

Epstein, S. (1991). "Cognitive-experiential self-theory: An integrative theory of personality", in R. Curtis, the relational self: *Convergences in psychoanalysis and social psychology*, pp. 111-137, New York: Guilford Press

Fama, E. (1970). "Efficient capital markets: A review of theory and empirical work", *Journal of Finance*, 25(2), pp. 383-417

Gervais, S. and Odean, T. (2001). "Learning to Be Overconfident", *The Review of Financial Studies,* vol. 14, no. 1, pp. 1-27

Gervais, S., Heaton, J., Odean, T. (2002). "The Positive Role of Overconfidence and Optimism in Investment Policy", pp. 1-36, The Rodney L. White Center for Financial Research

Golden, J., Milewicz, J., Herbig, P. (1994). "Forecasting: Trials and Tribulations", *Management Decision,* no. 32, issue 1, pp. 33-4

Hair, J. (1998). *Multivariate Data Analysis,* 5th edition, Upper Saddle River, NJ: Prentice Hall

Hastorf, A., Schneider, D., Polefka, J. (1970). *Person Perception,* Addison-Wesley, Reading, Mass

Hirshleifer, D. (2001). "Investor Psychology and Asset Pricing", *Journal of Finance*, no. 56, pp. 1533-1597

Hoffman, A., Shefrin, H., Pennings, J. (2010). "Behavioral Portfolio Analysis of Individual Investors", *European Journal of Finance*, no. 9, pp. 437-81

Kahneman, D., Tversky, A. (1979). "Prospect theory: an analysis of decision under risk", *Econometrica*, 47(2), pp. 63-91

Kline, R. (1998). *Principles and Practice of Structural Equation Modeling,* New York: The Guilford Press

Krejcie, R.V. (1970). *Determining sample size for research activities,* University of Minnesota, Duluth, 30, pp. 607-610

Malmendier, U., Tate, G. (2005). "Does Overconfidence Affect Corporate Investment? CEO Overconfidence Measures Revisited", *European Financial Management*, 11(5), pp. 649-659

Meinert, J. (1991). "Financial Advice from a Business Veteran", *Journal of Accountancy*, no. 171, issue 6, pp. 134-4

Miller, D.T. and Ross, M. (1975). "Self-serving Biases in Attribution of Causality: Fact or Fiction?", *Psychological Bulletin,* no. 82, pp. 213-225

Odean, T. (1998). "Volume, volatility, price and profit when all traders are above aver-age", *Journal of Finance*, 53, pp. 1887-1934

Olsen, R. (1998). *Behavioural finance and its implications for stock Price volatility*, Association for Investment Management and Research, Financial Analysis Journal, vol. 54, no. 2, pp. 10-18

Russo, E., Schoemaker, P. (1992). "Managing Overconfidence", *Sloan Management Review*, no. 33, pp. 7-17

Schneider, D., Hastorf, A., Ellsworth, P. (1979). *Person Perception,* Addison-Wesley, Pub. Co.

Seppälä, A. (2009). "Behavioral Biases of Investment Advisors: The Effect of Overconfidence bias, self-attribution bias and Hindsight", Thesis retrieved from http://hsepubl.lib.hse.fi/FI/ethesis/pdf/12150/hse_ethesis_12150.pdf

Shefrin, H. (2007). *Behavioral Corporate Finance. Decisions that Create Value,* McGraw-Hill/Irwin: New York

Shiller, R. (2005). *Irrational Exuberance,* Princeton: Princeton University Press

Svenson, O. (1981). "Are we all Less Risky and More Skillful than our Fellow Drivers?", *Acta Psychologica*, no. 47, pp. 143-148

Taylor, S. and Brown, J. (1988). "Illusion and well-being: A Social Psychology Perspective on Mental Health", *Psychological Bulletin,* no. 103, pp.193-210

Tversky, K. (1995). "The Psychology of Risk", in Behavio*ral Finance and Decision Theory in Investment Management*, CharlottesvillE, VA: AIMR

Ullman, M.T. (2001). *Declarative/Procedural Model,* Cambridge, MA: MIT Press

Verheul, I., Carree, M. (2007). "Overoptimism among entrepreneurs in new ventures: the role of information and motivation", Scales Research Reports H200723.

Weinstein, D. (1980). "Unrealistic Optimism about Future Life Events", *Journal of Personality and Social Psychology*, no. 39, pp. 806-820

Weinstein, D., Kline, R. (2002). "Resistance of Personal Risk Perceptions to Debiasing Interventions", in Th. Gilovich, D. Griffin and D. Kahneman, *Heuristics and Biases: The Psychology of Intuitive Judgment*, Cambridge, UK: Cambridge University Press

Wolosin, R., Till, J. (1973). "Effects of Cooperation and Competition on Responsibility Attribution After Success and Failure", *Journal of Experimental Social Psychology*, no. 9, pp. 220-235

Yosef, B., Kumar, A. (2012). "Political Climate, Optimism, and Investment Decisions", AFA 2012 Chicago Meetings Paper

**Appendix. List of abbreviations**

| | |
|---|---|
| BF | Behavioral Finance |
| SA | Self-attribution |
| OC | Overconfidence |
| OO | Overoptimism |
| DM | Decision Making |
| SEM | Structural Equation Modeling |
| RMSEA | Root mean square error of approximation |
| GFI | Goodness-of-fit index |
| AGFI | Adjusted goodness-of-fit index |
| CFI | Comparative fit index |
| TLI | Tucker-Lewis coefficient |
| CFA | Confirmatory Factor Analysis |

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# Opinions on the government assets evaluation

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**Abstract.** *The fact that the accounting can only submit one representation of the reality normally leads to the problem of not mistaking the image for the reality, of being fully aware of the gap between the two of them and of not becoming a prey of a dangerous illusion – such as it often happens with the amateur users of the accounting. We must admit that this image itself can create a new reality and influence the conduct of the economic agents by producing certain effects.*
*The issue of accounting truth or, more specifically, the adaption of the image within the accounting to the economic reality should be evaluated on the grounds of criteria such as accuracy, authenticity and validity.*
*Accuracy does not have to mean the exactness specific to a copy or the resemblance with a model since this reason is not unique and depends on the vision of the social protagonists. Therefore, it mainly refers to the other meaning of the term "accuracy", which we should keep in mind: an image that we can trust, that is trustworthy.*
*The debate over accountancy and state assets evaluation in governmental financial reports is a complex problem. In this paper we present evaluation methods of the government fixed assets, its illustrations in public entities financial reports – developing evaluation principles, we treat depreciation accounting and assets maintenance expenditures, and some perspectives over the approached domain.*

**Keywords:** Government assets, government fixed assets, realizable evaluations, reality representation issue, accounting truth, accounting as compromise between expectations and demands.

**JEL Classification:** H43.
**REL Classification:** 13B.

## 1. Evaluation and accounting records of government assets in the dedicated literature

The debate on the accounting and evaluation of non-financial assets in the financial reports of various governments is not something new. It generated, in the university environment debates, two opposite viewpoints:

First, the point of view of Professor N.R. Anthony, who shares the opinion of most experts, favoring a quasi-commercial concept of public accounting, which implies "the assessment and evaluation of assets, with a limited useful life and therefore the depreciation of public assets irrespective of their nature" (Anthony, 1978).

An opposite viewpoint has been expressed by Professor R.K. Mautz, in the paper called "Financial Reporting: Should Government Emulate Business?". As this professor sees it, public accounting must be functionally different from the commercial accounting and, therefore, it must show the provisioned commitments and financial contributions, not set a commercial-like balance-sheet. From this point of view, a list of non-financial government assets which are to be used, is sufficient, an evaluation thereof is useless.

While M. Anthony's position about the principles and procedure of government asset evaluation is generally accepted, we still witness theoretical debates, sometimes opposing, about how these are implemented in practice.

## 2. Methods used to evaluate government fixed assets

Different governments in strong industrialized countries adopted very different methods to evaluate assets and liabilities.

Those methods go from zero-assessment (Lüder, 1990) to the evaluation of all fixed assets at their current value and the depreciation of those assets during the assets' useful life, which is limited in time.

Below is a list of methods used by governments in North America and the European Union to book fixed assets and organize the related accounting records.

Methods used to evaluate government assets:

- Government evaluation.
- Assessment and evaluation of assets.
- Zero-assessment or an assessment of assets for the purpose of the "unique memory", as distinct.
- Some fixed assets or all fixed assets are documented and evaluated.
- Evaluation at the purchase cost.

- Evaluation at the purchase cost of assets with unlimited useful life and at a specific percentage applied to the purchase cost for assets with limited useful life.
- Evaluation at the purchase cost of assets with unlimited useful life and at the net purchase cost for assets with a limited useful life (calculation of cumulated amortization).
- Evaluation at the current (actual) value for assets with unlimited useful life and at the current net value for assets with a limited useful life.

Other evaluation methods are specific to each of the following countries: UK, USA, Germany, Canada, France, Denmark, Austria, Switzerland, Spain, Sweden. We can also list here the model used by the European Union.

This type of arrangement relies on the comparative analysis of public accounting systems conducted by Speyer (Lüder, 1991, p. 97).

We can say, if a number of specific aspects left aside, that governments use in fact five distinct methods and, obviously, multiple alternatives, to account for fixed assets and set the outcome, as follows (Roman, 2006, p. 147):

1. Fixed assets are not documented in the respective states; assets and liabilities are documented only for the purpose of an "unique memory" or at a "symbolic value".

The British Central Government, the American Federal Governments and the German Government use the first alternative, while the Canadian Government adopted the second alternative.

In these two cases, the expenditures incurred to purchase or build fixed assets are recorded in the profit/loss statement during the period of acquisition of construction.

In this case, the fixed assets are booked based on the incurred expenditures.

2. Fixed assets are booked based on the expenditures incurred at the cost of purchase, on assets and liability side, or at the increased costs of purchase.

The European Union adopted the first option – document the actual assets and book the same amount of assets under the "own equity" position in the balance sheet.

3. Fixed assets are booked on the assets side and the liabilities side under the cost of purchase, and they will be adjusted and booked at the market level (sale) at the time of their commissioning.

This is the method used by the Danish Government. Fixed assets are booked as assets and liabilities at the respective purchase cost and the net purchase cost (accounting of tasks).

The Australian Federal Government uses a relatively simple alternate method, which consists of booking fixed assets with a limited useful life, at 50% of the cost of purchase. As a result, a portion of capital expenditures is booked during the purchase period, and the other portion at the end of the fixed assets' useful life (at the time of decommissioning).

The second alternative of this method is applied by the Spanish Central Government, the Swedish Government and the Cantons of Switzerland.

4. Fixed assets with a limited useful life are depreciated during the entire useful life and the annual expenditure, the amortization, impact on the current year operations, and represent capital consumption.

5. Fixed assets are booked on the side of assets and liabilities at their current value (replacement cost), in other words at their current cost of purchase or construction, calculating, at the same time, the cumulated amortization in respect of fixed assets with a limited useful life.

The situation of assets and liabilities at current prices, relying on "historical costs" is published by the Swedish Government on an annual basis.

## 3. Evaluation principles of government fixed assets

All government fixed assets (ordinary, collective and military) should be evaluated and published in the government statements of assets and liabilities.

The discussion is raised about the axiomatic assumption – to what extent the governments make efforts, over a long time span, to cover the volume of resources consumed through recovered resources. From this viewpoint it should be demonstrated, in respect of each budget year, to what extent the taxpayers have borne the costs of services provided to them (Henke, 1987, pp. 18-22).

Consequently, public accounting should focus on annual operating results, in other words the net surplus of net consumption of resources. This concept, similar to the concept of the revenue used in the private sector, corresponds to "capital conservation", "flow of economic resources" (GASB, 1985; Freeman, Shoulders, Lynn, 1988, p. 674), "accrual accounting" or "collection-based accounting" concepts.

The concept related to the net consumption of resources involves the booking of capital consumptions, and, therefore, the amortizations.

As a result of this fact, it is necessary to know the value of all fixed assets with a limited useful life. For the other fixed assets, the case in support of their evaluation is not yet a present-day subject.

The evaluation of fixed assets with unlimited useful life is however necessary, at least for two reasons.
1. If the double-entry accounting is used, the newly purchased fixed assets should be evaluated and included in the balance sheet to demonstrate that records are accurate and in particular to avoid distortions in the state-of-play.
2. On the users' side, the financial reporting (summary) present by governments allows the recognition of the surplus or net annual consumption of resources, but also of the value of accumulated resources, the total asset amount compared to the total liability amount.

This amount indicates the extent to which, over a substantial time span, the government uses its liabilities to fund investments or consumption.

*Incomplete inventories.* In many inventories, the information on government assets is shown only as quantities (physically).

From experience, we can say that the absence of a regular and systematic reporting on fixed assets, makes room to poor, inconsistent inventories, to incomplete and, most of all, obsolete records.

While public financial accounting requires the presentation of the amount of fixed assets and the booking of assets, in a systematic way, this can result in a better material control compared to the existing one and an improvement of the inventories of fixed assets.

The evaluation of all fixed assets is a highly controversial issue.

The problem under discussion is the usefulness of data provided in terms of cost-benefits.

The complex evaluation of many fixed assets, such as, for instance, natural resources, the land and unused mineral deposits, the continental platform etc., the "inherited" assets (such as monuments and art collections), as well as the depreciation of infrastructure (motorways, pipes, highways etc.), raises the question of how useful the asset evaluation is.

All reservations and opposite opinions considered about the evaluation of government fixed assets, the conclusion which can be derived as well as a result of the concept related to the net consumption of resources, is that the government fixed assets with a limited useful life and the new fixed assets with unlimited useful life should be evaluated and included in the balance sheet.

Empirical studies showed the need for governments to prepare financial reports, providing the account users with information on fixed assets and the value thereof. The large majority of users in Canada and USA claim that tangible assets must be booked in the balance sheet under assets and moved to expenditures only at the time of consumption or sale.

An accounting system based on the concept of net consumption of resources allows firm limits up to which the government may use the fixed assets, as well a thorough control.

The booking of tangible assets of governments based on expenditures does not impact on the quality of current information published by the governments, on the contrary, this provides essential information for the performance assessment and, in particular, the appreciation of efforts made by different generations.

## 4. Evaluation of realizable fixed assets

Realizable fixed assets of governments should be evaluated at their net market value or a close market value.

Two evaluation methods are contemplated:
- An evaluation which is similar to the evaluation principles of the private sector;
- An evaluation at the value which is expected to materialize.

The partisans of the first method propose that realizable fixed assets are evaluated in the same way used by commercial companies. The evaluation of these assets in the public accounts must therefore match the evaluation in the commercial accounting.

The second method consists of establishing the realization value. From this point of view, the realizable fixed assets are financial resources which must be capitalized at their value and the net value of which is the value realized on the market, estimated at the end of the period (value expected to materialize). If the market value cannot be verifiable and foreseen, the following aspects will be taken into account:
- The market value of an equivalent asset;
- The purchase or construction cost of escalated with the price index;
- The net value of the asset of a distinct unit the purpose of which is to obtain a benefit.

If we compare the two methods used to evaluate the realizable fixed assets, we may say that the evaluation according to the estimated realizations is preferred.

## 5. Perspectives

There is a high diversity of methods used to book the government fixed assets, even in developed countries with comparable political, economic administrative systems. In all these countries we find the traditional opinion according to which these fixed assets should not be entered in financial situations.

Reforms were commenced in the countries most sensitive to this discussion, and, eventually, the public accounting and the financial communications were adjusted to the needs of information of the public and users.

While international bodies were established to standardize the accounting (such as, for instance, the IFAC Public Sector Commission, the FEE Public Sector Commission, and the INTOSAI accounting standardization committee) and achieve international harmonization, the current developments show a slowdown of the renewal process pace.

If the traditional system of booking assets is preserved, we will always encounter the same difficulties, namely:

- Mediocrity in the management control;
- Lack of information about the value of realizable assets;
- Lack of information about the "non-realizable" assets compared to the long term liabilities.

The need of improvement is obvious and profound changes are inevitable, sooner or later.

After the first steps were taken in the direction of changing accounting procedures, the governments know well enough the reservations related to the evaluation of fixed assets, the problems of conceptual and technical nature, in addition to the directives and still substandard theses of experts. Therefore, after the first stage of application of the generalized accounting system, the issue of evaluating fixed assets is, once again, a very present-day issue.

## 6. The issue of representing the reality

Since accounting cannot provide but a single representation of reality, the main issue is to not mistake the image for the reality, to remain perfectly aware of the distance between the two of them and to not give in to dangerous illusions, *as unskillful accounting users often do*. We have to admit that this image creates, in itself, a new reality and impacts the behavior of economic agents, producing certain effects.

The issue of accounting truth or, more exactly, the adequacy of the accounting image to the economic reality must be assessed in terms of reliability, genuineness and validity. Reliability is not supposed to mean a copy-like precision or the resemblance to a model, as this is not unique and it depends on the vision of different social protagonists. We have here the other meaning of the term reliability, which is worth keeping in mind: *an image which can be trusted, which can be credited as truthful.*

The authenticity issue may not be examined on an ontological basis, as there is no accounting for the sake of accounting, but only in given social and historical circumstances. Authenticity may mean sincerity: financial situations may be seen as false if the intention of deception can be proved. Authenticity may refer to the quality of a document which substantially derives from the author to which it is attributable, therefore the importance of signatures which produce an effect of authenticity.

## 7. Is there an accounting truth?

The accounting truth issue is not raised arbitrarily or either in an "ontological" manner. Social implications are highly important.

What can the accounting reveal? What can it hide?

A lot is expected from the accounting, as it is capable to give, according to the national legislation, „a true picture of the assets, financial situations and economic outcome". This idea has been borrowed from the British legislation, which created the expression "true and fair view" ("an accurate and reliable point of view"). But the expression has never been defined and raised many critical comments. The idea was promoted that there may be more "reliable" images of the same reality, as there can be more photographs taken of the same object, depending on the angle from which one looks at it, the light, distance etc., and therefore what is to the highest extent in accordance with the law should be selected.

The focus is on the contradiction risks which may arise between the observance of accounting principles and the care for reflecting the economic reality.

Social validation comes, on one hand, from accounting standardization, and on the other hand, from the intervention of the accredited professionals which certify the financial statements. By virtue of this analysis, it is not possible to say that accounting has the capacity to utter a truth, an objective message. In vain do we wish to know what is real, as the media often does, the "true" value of the "actual" outcome of a company when various opinions are advanced. As André Cibert wrote, there are as many truths as recipients of the information, and to the extent

that it excludes the reality, the diminishing effect of each measurement is unavoidable. Others (Bernard Colasse, Daniel Boussard) acknowledged as well that the "truth" brought by the accounting is *nothing but a filter which makes a reality understandable.* However, due to its inner coherence, which brings strength and weakness as well, the accounting allows reaching a formal truth based on a few postulates: conventions, norms, classification rules, professional reasons.

## 8. Is accounting a compromise between expectations and demands?

Facing an economic environment in which social relations are in motion, the accounting finds itself in an increasingly difficult situation when it comes to responding to all the functions assigned to it: legal means of proof, a management and control instrument, an element of arbitration for between economic agents. Accounting is not only an instrument, *it is a social phenomenon crossed out by the contradictions of the society and it became a stake for the various social protagonists, each of them trying to take advantage of it based on their own interests.* The output it provides cannot be but the outcome of a *compromise between expectations and multiple demands.*

Finally, the evolution of the accounting system is linked to the technical developments: as information technology instruments, it will allow recording enormous volumes of data and blending it into the most various and complex molecules; soon it will become possible to prepare different financial statements based on distinct evaluation criteria. This will allow an opening towards multiple appreciations explaining various aspects of the economic reality. Accounting may help achieving the world's economic democracy.

## Conclusions

Although after the first steps taken toward amending accounting procedures, the governments still know very well a lot of reluctant related to evaluation of fixed assets, conceptual and technical problems. The imperious need to achieve an improvement in the government accounting systems is obvious, for these reasons given by its multidimensional importance (social, economic, speed rate and so on) of the approached domain, and large-scale changes are inevitable in a shorter or greater period of time. Attaining final desideratum – which is getting a "true and fair view of the assets, liabilities, financial position and economic performance", transparent, with a high degree of comparability – will automatically lead to the creation of extremely useful tools on the basis of which will be explained in a consistent manner different facets of internal socio-economic or regional reality.

## References

Anthony, R.N. (1978). "Financial Accounting in Nonbusiness Organizations", Stamford C.T., Financial Accounting Standards Board

Capron, M. (1994). *Contabilitatea în perspectivă (Accounting Outlook)*, Editura Humanitas, Bucureşti, 1994

Feleagă, N. (1996). *Controverse contabile (Accounting controversies)*, Editura Economică, Bucureşti, 1996

Freeman, R.J., Shoulders, C.D. and Lynn, E.S. (1985), GASB – Governmental Accounting Standards Board

Henke, E.O. (1987). "Governmental Financial Statements - Generational Equity Reporting", The Government Accountants Journal

Ilie, V. (2010). *Gestiunea financiară a întreprinderilor (Financial management of enterprises)*, Editura Meteor Press, Bucureşti

Ilie, V., Teodorescu, M. (2005). *Finanţele întreprinderii (Finances of enterprises)*, Editura Meteor Press, Bucureşti

Lüder, K. (1990) "Vergleichende Analyse öffentlicher Rechnunssysteme – Querschnittsanalyse", *Speyer Forschungsberichte*, no. 89

Lüder, K. (1991). "Die zentrale Rolle des Rechnungskonzepts fllr die Ausgestaltung des öffentlichen Rechnungswesens", *Speyer Forschungsberichte,* no. 93, p. 97

Mautz, R.K. (1981). "Financial Reporting: Should Government Emulate Business?", *Journal of Accountancy,* 191:3, pp. 53-60

Roman, C. (2000). *Gestiunea financiară a instituţiilor publice (Financial management of public institutions)*, Vol. I, Editura Economică, Bucureşti

Roman, C. (2004). *Gestiunea financiară a instituţiilor publice. Contabilitatea instituţiilor publice*, *(Financial management of public institutions. Accounting of public institutions)* Vol. II, Editura Economică, Bucureşti

Roman, C. (2006). *Gestiunea financiară a instituţiilor publice (Financial management of public institutions,* Editura Economică, Bucureşti