**Business Administration**

# Romania's Foreign Debt: Trend, Structure, Indicators

**Camelia Milea**[1]

**Abstract:** The foreign debt is a solution for supplementing the internal savings. The objectives of the article[2] are to analyze the evolution of Romania's medium and long-term foreign debt and of its components between 2005 and 2013, as well as the structure by creditors of the medium and long term Romanian public foreign debt, to highlight some of the causes that explain its evolution and structure and to show if Romania's foreign debt is sustainable, using comparative analyses, qualitative and quantitative evaluations, interpretations and correlations. The results of the analysis show that 2009 has represented a turning point in the evolution of the Romanian foreign debt on the medium and long term and its components. Also, although the values of the analyzed external debt indicators still show a good payback and indebtedness capacity of our country, a complex and coherent reimbursement strategy must be developed in agreement with the progress of the economic reform. An indebtedness strategy should also be drawn up, taking into consideration an optimal ratio between the different maturities of foreign debt, in order to avoid payback peaks.

**Keywords:** creditors; debt sustainability; indebtedness strategy; reimbursement strategy; external debt indicators

**JEL Classification:** F21; F34

## 1 Introduction

The foreign debt[3] is a solution used to supplement the internal savings, which gives the country receiving the loan, the possibility to finance a higher volume of investments than possible when using only the domestic resources. The foreign debt also supplements the internal credit and maintains the demand within

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[2] The article is based on the chapter "Assessing the balance of payments", from the research project "The financial state of Romania" elaborated in CFMR "Victor Slăvescu" in 2013, under the coordination of Prof. E. Dinga, PhD

[3] The definition of the foreign debt given internationally presents gross foreign debt, at a particular moment, as the "total amount of the contracted loans, used and not paid back, up to that particular moment, from the foreign financial markets, and the obligation of the residents to reimburse the capital installments and the related interest".

convenient limits. Also, it improves the standard of living and supports the transition process. The foreign loans can be also used to refinance the temporary deficits of the balance of payments, providing an alternative to the reduction of the internal consumption. (Milea, 2009) The foreign financing provides access to more debt instruments, which allows a more efficient management of the risk and of the cost of debt, which can thus be cheaper than the internal financing.

The article analysis the evolution of the medium and long-term foreign debt and of its components from 2005 to 2013, as well as the structure by debtors of the medium and long-term external public debt of Romania. In addition to other existing studies (Monthly Bulletins and Annual Reports of the National Bank of Romania), the author aims to highlight some of the causes, which explain the evolution and structure of the Romanian foreign debt. Finally, the author calculates some of the foreign debt indicators and shows whether they have had sustainable levels. The methodology used consists in comparative analyses, qualitative and quantitative evaluations, interpretations, correlations and proposals of measure.

In Romania, the slow and insufficient pace of the structural reforms has led to a structural imbalance of the economy, which generated considerable deficits of the current account and of the consolidated state budget, produced by an economy, which consumes more than it produces. Given a low rate of the internal accumulation, these deficits and the internal absorption for consumption and investments have been covered by foreign savings, either as investments, or as loans, which have increased gradually the foreign debt. Thus the medium and long-term foreign debt has increased almost continuously starting with 1990, 2013 being the first year when the foreign debt has decreased. The external public debt has also increased almost continuously after 1990, peaking in 2009-2012, when Romania has taken a foreign loan from the international financial organizations.

Although as a proportion of the GDP, the medium and long-term Romanian foreign debt is within the limits that are considered sustainable internationally, it is necessary an analysis of the causes which have lead to this ever increasing trend of the foreign debt in Romania and of how much the foreign debt has supported the economic growth of Romania. Thus, it is acceptable that a country increases the volume of foreign loans, as long as the marginal product of the borrowed capital is higher or equal with the cost of the loans, because, only in this situation, the increase of the foreign debt improves the growth rate of the national income. The foreign loans do not contribute to the economic growth if they are used inefficiently (i.e. to finance unproductive activities such as the consumption, to balance the excessive exports of capital, or with lower yields than the interest rate paid for them); on the contrary, they lead to the necessity to take more loans, which eventually limits the access of that country to foreign financing and even to a foreign debt crisis. (Milea, 2009)

## 2. The Evolution of the Medium and Long-Term External Debt and of its Components

The medium and long-term external debt has increased continuously in Romania after 1990. This evolution had a moment of change in 2013 when the medium and long-term external debt decreased for the first time after 1990 (see Figure 1).

The external public debt has increased almost continuously from 2000 to 2013.

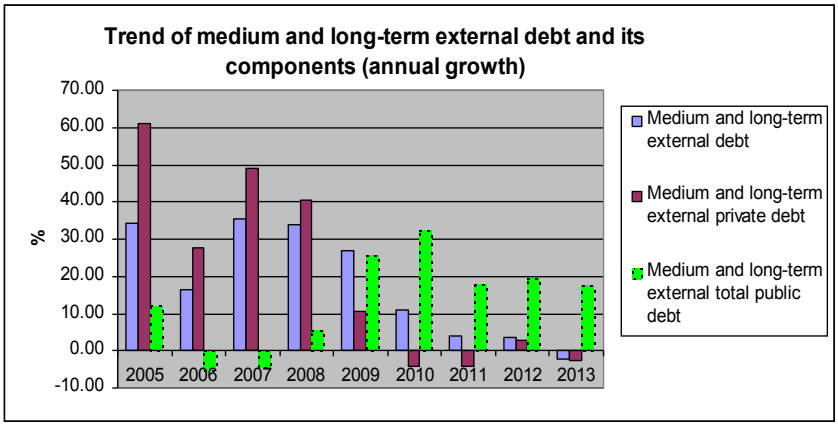


**Figure 1. Trend of Romania's medium and long-term external debt and its components (%)**

*Source: Author's calculations based on NBR data*

A point of turn in the evolution of the medium and long-term external debt and its components has been in 2009 (see Figures 1 and 2).

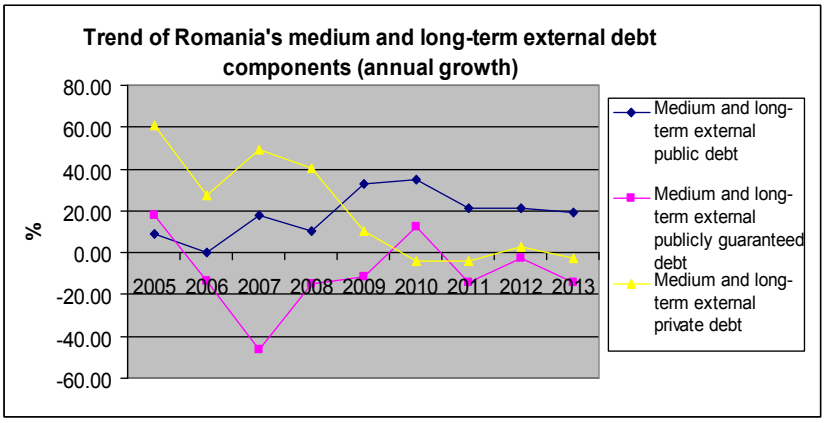


**Figure 2. Trend of the components of Romania's medium and long-term external debt (%)**

*Source: Author's calculations based on NBR data*

Thus, the medium and long-term external public debt has increased strongly, while the external private debt and the external publicly guaranteed debt have decreased beginning with 2009 (see Figures 1 and 2). The evolution of the external public debt is explained by the 20 billion Euro loan received from the international financial organizations (the International Monetary Fund, the European Commission and the World bank), which was cashed between 2009 and 2012, loan used for internal financing. This was due to the lower inflow of "free" capitals in the context of the higher risk aversion of the investors and of the lower level of international liquidity.

Within this context, the proportion of the external public debt within the total external debt has increased starting with 2009 (see Figure 3).

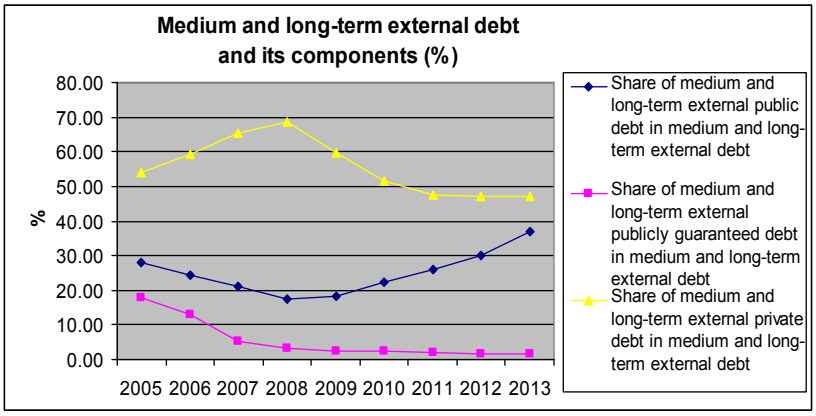


**Figure 3. Share of the components of Romania's medium and long-term foreign debt in the external debt (%)**

*Source: Author's calculations based on NBR data*

The steep slowdown of the growth trend of the external private debt in 2009 and its decrease in 2010, 2011 and 2013 (see Figures 1 and 2) is due, among others, to the lack of liquidities, to the significant decrease of the economic activity and to the risk aversion of the creditors following the economic financial crisis and its effects. Before 2009, during the years that preceded the crisis, the foreign debt of the private sector increased significantly on the background of the optimism generated by the economic boom. The increase of the external private debt was also noticed in 2012, but at a lower rate.

It has been noticed that many times, the private sector preferred to borrow from the foreign markets, against a rather advantageous external cost compared to the cost of the internal sources of financing, under the given circumstances of some key-variables of the Romanian economy (high interest rates for credits, over-evaluated

real exchange rate of the national currency, excessively prudent behaviour of the local banks in the lending process).

From 2005 to 2010, the private foreign debt represented the majority of the medium and long-term foreign debt of Romania (see Figure 3), which shows a high dependence on the foreign financial markets within a context of risk and uncertainty both for the debtors and for the creditors. A good evolution for the sustainability of the Romanian foreign debt is represented by the decrease of the external private trade debt as of 2009 (see Figure 3).

We notice that in 2013, the external public debt has witnessed an "unexplainable" evolution. Thus, although Romania has returned 4.6 billion Euros to the International Monetary Fund, the external public debt of Romania has increased in 2013. Another significant fact is that the reserves assets of the National Bank of Romania have grown the same year. Analyzing the evolution of the other components of the financial account we find partially the explanation of this seemingly paradoxical evolution. Thus, although in 2012 and 2013, Romania has returned large amounts of funds to the International Monetary Fund, the external public debt has not decreased because Romania has borrowed large amounts of capitals from the international bonds market, and she has also received other funds from IBRD and EIB. This evolution is reflected by the balance of the portfolio investments account which, in 2011, 2012 and 2013, has had extremely high positive values compared to the previous period. Thus, the institutional creditors have been replaced with private creditors. Given that the debt from the multilateral institutions has lower costs, taking into account the interest rate for the countries rated as risky on the private market of the international capital; longer period of grace; longer total duration; the replacement of the creditors represents an extremely negative evolution for the Romanian economy. Instead of returning the foreign debt, Romania has borrowed more, under more harsh credit conditions (Milea, Ailincă, Bălăşescu, 2013). However, the issue of bonds does not explain all the increase of the external public debt. And there have not been other inflows of foreign capital registered into the capital and financial account of the balance of payments. Under these conditions, the question rises about the origin of the funds that have determined the increase of the external public debt in 2013 and why they are not recorded into the balance of payments?!

In conclusion, in the context of the almost continuous increase of the external public debt, it is absolutely necessary to draw a complex and coherent strategy for the reimbursement of the foreign debt, in agreement with the progress of the economic reform and with the restructuring of the national economy. A debt strategy must also be developed, in order to establish an optimal ratio between the medium and long-term debt, on the one side, and the short-term debt, on the other

side, between their maturity dates, so that the burden of the foreign debt to be distributed uniformly over the years, thus avoiding payment peaks.

## 3. Analysis of the Structure by Creditors of the Medium and Long-Term External Public Debt

The multilateral credits represented the majority of the medium and long-term external public debt in almost every year of the period analyzed (except 2007 and 2013) (see Figure 4), which show the need of the Romanian economy for external financing, both during the period of economic boom, and especially within the context of the world economic and financial crisis, 2009 and 2010 showing an important increase.

The shares held by the European Union and by the International Monetary Fund within the medium and long-term external public debt have increased significantly in 2010 and 2011 due to the loan received by Romania from these two institutions, while the shares held by IBRD and EIB have decreased in a discontinuous manner (see Figure 4).

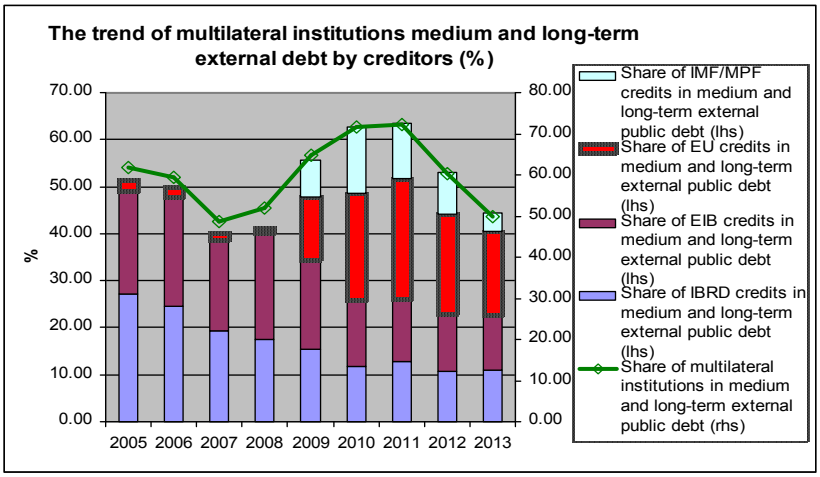


**Figure 4. Share of the different multilateral institutions in the medium and long-term foreign public debt of Romania (%)**

*Source: Author's calculations based on NBR data*

The loans received from official creditors have several advantages: lower costs taking into account the interest rates charged to the countries perceived as risky on the private market of the international capital; longer period of grace; longer total duration, which eases the repayment effort. These credits have also disadvantages,

however: the funds available are limited; the high use of this kind of financing conveys a negative message to the foreign investors, because exceptional financing is intended to cover the current account deficit and to support the efforts of structural adjustment of the beneficiary economy. In conclusion, this signal points to reform efforts that have been never accomplished. (Milea, 2009).

## 4. The Structure of the Reserve Assets of the National Bank of Romania

The reserve assets of the National Bank of Romania have increased almost continuously (except for 2012), evolution, which shows the solidity and credibility of Romania from the financial-banking point of view. These capitals should be, however, consolidated by adequate public policies which should value them, and by making adequate use of them with yields as high as possible.

Although the monetary gold has a small share within the reserve assets of NBR, its value has increased significantly between 2009 and 2011. However, the value of this reserve asset has decreased drastically in 2013 (see Figure 5).

2012 represents a particular situation, because the reserve assets of the National Bank of Romania, through its component the foreign exchange reserve, have decreased significantly because Romania has returned a significant part of the loan from the International Monetary Fund (see Figure 5).

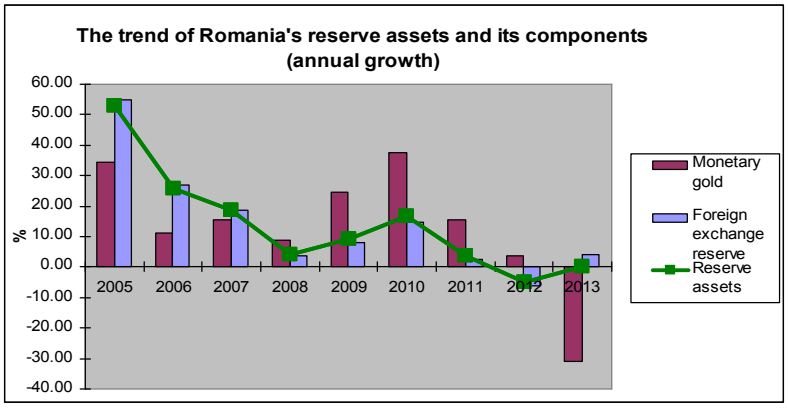


**Figure 5. The Annual Growth of Romania's Reserve Assets and its Components (%)**
*Source: Author's calculations based on NBR data*

## 5. Analysis of the Indicators of External Debt of Romania

Based on the above analysis, taking into account the level of the external debt to be returned and the sources for financing it, the authors will calculate and explain the evolution of some of the indicators of external debt of Romania from 2005 to 2013.

**Table 1. External Debt Indicators in Romania**

| Indicators | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|
| **$ED_{MLT}$/GDP (%)** | 30.9 | 29.3 | 31.1 | 37.0 | 55.6 | 58.6 | 57.8 | 59.8 | 53.9 |
| **$ED_{MLT}$/EXP (%)** | 93.2 | 91.0 | 106.1 | 121.9 | 181.9 | 165.7 | 144.5 | 147.3 | 128.5 |
| **FER/IMP (months)** | 6.3 | 6.4 | 6.1 | 5.6 | 8.5 | 8.4 | 7.5 | 7.1 | 7.0 |
| **FER/$ED_{MLT}$ (%)** | 74.3 | 80.1 | 70.2 | 54.6 | 46.9 | 49.3 | 49.1 | 45.0 | 46.0 |

*Source: Author's calculations based on NBR data*

On the background of the almost continuous increase of the exports of goods and services, of Romania's reserves assets and of the medium and long-term external debt, the external debt indicators that we have calculated have remained within the limits that are considered normal at the international level, almost throughout the entire analyzed period (see Table 1)

***The medium and long-term external debt within the GDP ($ED_{MLT}$/GDP)*** displayed spectacular leaps in 2008 and, particularly, in 2009. This is explained by the increase of the external public debt due to the 20 billion Euros loan taken by Romania from the international financial organizations, which was cashed in between 2009 and 2012. The increase of this indicator during the analyzed period also shows that the medium and long-term external debt has increased faster than the growth of the GDP (see Figure 6). The evolution of this indicator shows the decrease of the medium and long-term external debt in 2013. Although the value of the medium and long-term external debt within the GDP is not very large, as compared to the international standards, the rate of growth of this indicator represents a sign of alarm, which requires a careful monitoring and the adoption of a coherent strategy of the external debt. An excessive increase of the share of the external debt within the GDP involves an increased probability of future difficulties in securing the service of the external debt. Therefore, such a country would be compelled to increase the fiscal burden of the economic agents or to depreciate its national currency, on the condition that the evolution of exports is elastic in terms of price, in order to get the funds necessary to pay back the external debt.

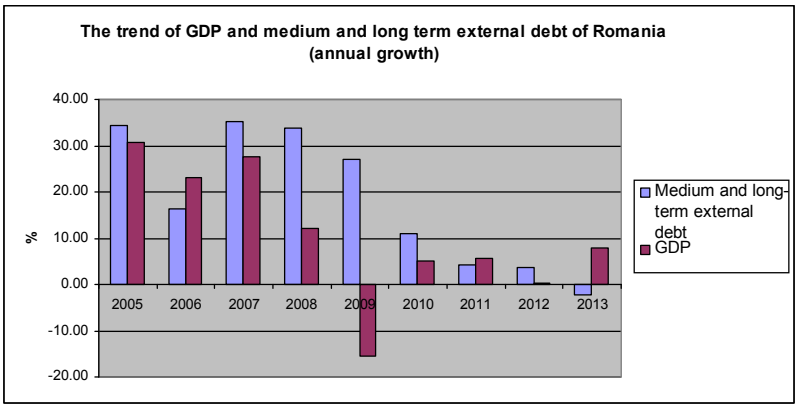


**Figure 6. The Annual Growth of Romania's GDP in Comparison with the Medium and Long-Term Foreign Debt (%)**

*Source: Author's calculations based on NBR data*

If we analyze the evolution of the medium and long-term external debt within the GDP by its components (external public debt and external private debt), we notice that throughout the period 2005-2013, the share of the external public debt within the GDP has been below the share of the external private debt within the GDP; we can also see that the share of the external public debt within the GDP has increased and the share of the external private debt within the GDP has decreased starting with 2008 (see Figure 7). This evolution can be looked at as positive, considering that the external public debt is more sustainable than the external private debt.

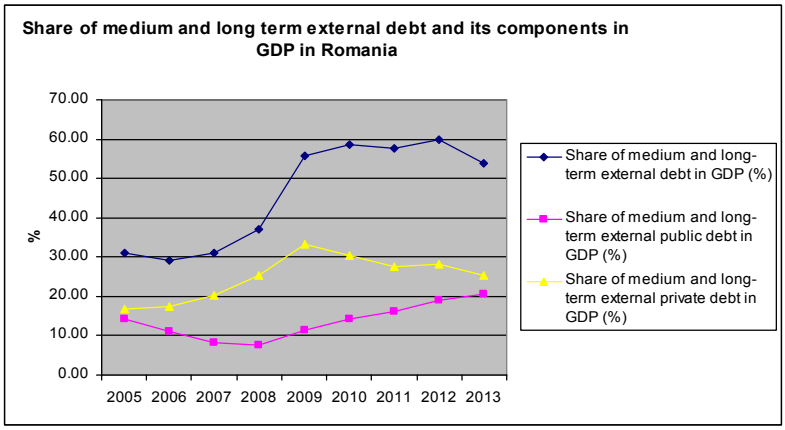


**Figure 7. The Share of Medium and Long-Term Foreign Debt and its Components in GDP in Romania (%)**

*Source: Author's calculations based on NBR data*

The significant increase of the indicator ***medium and long-term external debt within exports ($ED_{MLT}/EXP$)*** between 2006 and 2009, on the background of the continuous increase of the exports (except 2009), shows an evolution of the medium and long-term external debt that needs to be monitored in order to avoid the payback peaks and the excessive repayment burden of Romania. It is also absolutely necessary that the credits should be used either for projects that have higher yields than the interest rate at which these capitals have been obtained, or to support the economic revival and the economic growth, and not for unproductive consumption. A positive evolution is represented by the decrease of this indicator starting from 2010, on the background of an increase of the exports, although the medium and long-term external debt has also grown during this period (except in 2013). Although the share of the external debt within the exports has remained below the critical international level, after 2008 it has approached much to this level. The strong increase of this indicator is explained by the higher rate of growth of the medium and long-term external debt compared to the rate of growth of the exports; this situation was understandable during the early years of transition, but it still continues, affecting negatively the economy. If the external debt would be a boosting factor for the exports, the ratio of the external debt to the exports would have a decreasing or, at least, a constant trend.

If the expenditures financed through external debt contribute only to the increase of the demand for loans, and not to the improvement of the production capacities, the exports will not be able to increase sufficiently in order to generate the improvement of the balance of payments and of the payback capacity. It might even be necessary to take more loans in order to prevent the decrease of some imports needed for exports, which support the payment of the external debt. Therefore, the external debt would continue to increase faster than the exports.

The increase of the reserve assets throughout the period 2005-2013 (except 2012), and even before 2005, has generated the improvement of the ***coverage of imports from the reserve assets (FER/IMP (months))***, this indicator reaching a maximum level of 8.5 in 2009 (see Table 1, Figure 8). The rate of imports coverage from the reserve assets has been, throughout the analyzed period (except 2008), above the 6 months limit, which is internationally considered as maximum. The improvement of this indicator is due to the increase of the reserve assets through purchases of hard currency from the exchange rate market, these amounts resulting from direct and portfolio investments of non-resident entities, from privatizations, from public external loans and from issues of state bonds on the international markets.

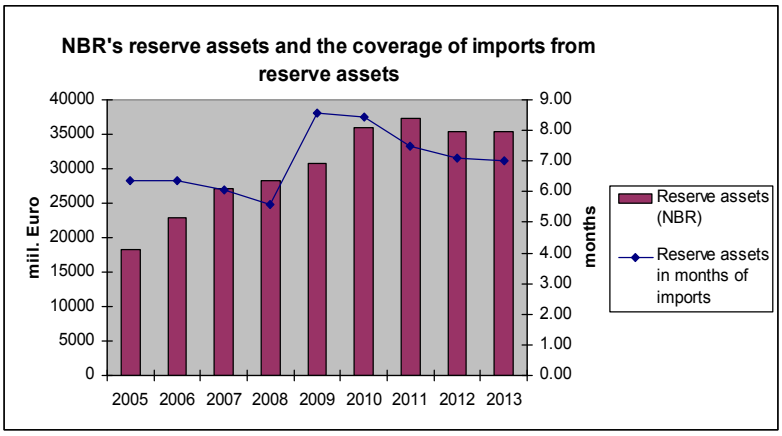


**Figure 8. The Coverage of Imports from Reserve Assets and the Reserve Assets of the National Bank of Romania (%)**

*Source: Author's calculations based on NBR data*

***The ratio of the reserve assets to the medium and long-term external debt (FER/ED$_{MLT}$)*** has exceeded the low critical limit in almost all the years of the analyzed period. This indicator was minimal in 2009 (when the medium and long-term debt has increased significantly) and in 2012 (when the reserves assets have decreased).

The values of the analyzed debt indicators show a still good indebting and reimbursement capacity of the external debt of our country.

In conclusion, in the last years, Romania needed external financing for the balance of payments, for structural adjustments, to finance the state budget and some investment projects and to consolidate its reserve assets. This external financing, needed to complete the internal resources, has generated external debt, which is still within sustainable parameters, as seen from the analysis of the external debt indicators. Considering that the external debt service is rather high, the real economy doesn't shows signs of complete recovery from the crisis, while the further build up of deficits financed by flows which generate external debt may shortly bring to critical levels of the indebtness level of our country, it is necessary that the external debt management and the strategy for external indebtness should be a part of the macroeconomic policies elaborated by the decision factors. Other worrisome reasons are the accelerated increase, over the recent years, of the share of medium and long-term external debt within the exports and of the rate of the external debt within the GDP. (Milea, 2009)

## 6. Conclusions

Any external credit must be justified economically, commercially and politically, for its intrinsic value.

Any country should maintain a debt capacity which allows it to cope with unpredictable situations, such as the need of emergency loans to equilibrate the balance of payments.

2009 has been a turning point in the evolution of all types of external debt of Romania. Thus, the external private debt slowed down abruptly its increase in 2009, and has decreased during the following years, due to the lack of liquidity, to the significant reduction of the economic activity and to the risk aversion of the creditors, generated by the economic and financial crisis and its effects.

The medium and long-term external public debt increased significantly between 2009 and 2011 due to the foreign loan taken by Romania from the international financial institutions, because the internal resources have been considered to be insufficient.

Most of the medium and long-term external public debt comes from multilateral creditors in almost every year of the analyzed period. This shows the interest of the international financial organizations for the evolution of the Romanian economy, and the needs of the Romanian economy for external financing both during the economic boom and, particularly, within the context of the world economic-financial crisis.

2012 and 2013 showed extremely high values of the inflow of portfolio investments compared to the previous period. As a personal contribution, I notice that the institutional creditors have been replaced by private creditors. In the context in which the debt from the multilateral institutions has lower costs, considering the interest rate charged to the countries perceived as risky on the international private capital market; it has a longer period of grace, a longer total period; I draw attention on the fact that the replacement of the creditors represents a deeply negative evolution of the situation of the Romanian economy. Instead of paying back the contracted external debt, our country makes more debts, in harsher credit conditions. I also highlight that the issue of bonds does not explain all the increase of the external public debt. Considering that there have not been other inflows of foreign capital registered into the capital and financial account of the balance of payments, the question rises about the origin of the funds that have determined the increase of the external public debt in 2013 and why they have not been recorded into the balance of payments?!

The analysis of the debt indicators shows that the external debt has not been used for profit yielding, productive purposes, for generating economic growth and the

increase of the gross domestic product, but for other purposes, among which non-productive consumption. Therefore, the increase of the external debt at the rates at which it had taken place has not been justified by the economic growth. The long-term use of a significant part of the external debt for non-productive consumption distorts the prospects for normal reimbursement of the external debt, which will eventually lead to seeking emergency solutions to avoid the loss of liquidity, or, even worse, the state of default.

Given these evolutions of the external debt and its components, although the values of the analyzed external debt indicators still show a good payback and indebtedness capacity of our country, a complex and coherent reimbursement strategy must be developed in agreement with the progress of the economic reform and with the reorganization of the national economy. An indebtedness strategy should also be drawn up, taking into consideration an optimal ratio between the medium and long-term debt and the short-term debt, namely between their due dates, so that the burden of the external debt should be spread uniformly along the years, thus avoiding payback peaks.

A positive aspect consists in the fact that all along the analyzed period, the reserve assets have consolidated, while its exchange rate structure has harmonized with the exchange rate structure of the medium and long-term debt and of the medium and long-term debt service. The almost continuous increase of the reserve assets (except 2012) shows the financial and banking solidity and credibility of Romania.

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# Tax Evasion and the Impact on Economic Growth

## Acta Universitatis Danubius. Œconomica

**Shkendije Demalijaj Ukaj**[1]

**Abstract:** The level of taxation is very important for the development of current and future of a country and fiscal policy should always be considered as an important factor in the behavior of participants and their ability to tax evasion and informality. Government fiscal policies can trigger tax increase under pressure, especially in situations such as economic crisis, inflation, unemployment, instability, when the burden of this obligation grows, its effects are considered to take them to tax evasion and informality (Dragomir. et al. 2011). However, these reasons do not relate to all the great presence of this phenomenon in Kosovo, taking into account the recent economic crisis has not reflected in the economy of Kosovo and the Kosovo tax burden is among the lowest in the region, but leading cause of tax evasion and informality can be considered above the corruption of public administration officials including tax and customs officials, insufficient staff for his fighting, weak rule of law, as well as lower fiscal culture for paying taxes. For this reason the scope of this paper will be the theoretical treatment of the informal economy and tax evasion in view of tax avoidance, meaning, characteristics and their effects on the economy and possible recommendations on these viewpoints**.**

**Keywords:** tax evasion; informal economy; economic development; tax policy; tax administration

**JEL Classification:** H26

## 1. Introduction

As an essential element of modern society, the tax should be defined as primary objective of public authorities to provide the amount of resources required to perform state functions, in support of social issues, compliance and fiscal discipline. In Kosovo, the collection of taxes made by the Tax Administration of Kosovo, organized and distributed in six regions and Kosovo Customs.

Tax has been an important field of politics throughout history and will continue to stay in the decisive role in the future politics of each state because it forms the basis of his income. Although everyone knows that taxes are essential for the government can be assumed that no one likes to pay taxes. For this purpose in recent years with more and more researches are being made to find the reasons and

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methods to reinforce and encourage taxpayers who with dedication and responsibility as citizens to play an important role in the process of collecting taxes. (Torgler & Schaltegger, 2006, p. 2)

There are many factor that can have an impact on tax avoidance such as institutional weaknesses, trust in public institutions, and the informal economy, the fight against tax evasion as one of the primary duties of the Tax Administration should work first inter alia relating to potential corruption in the administration ranks as turn to them as well as an offer made by dishonest taxpayers who strive through the phenomenon of avoidance of tax benefit, namely the presence of this phenomenon and its extent of spread that send course in reducing tax revenue. Kosovo is ranked 43 tax free report "Doing Business Report 2014" by 189 countries (World Bank, 2014).

Desire to inspire society is the first wish of every patriotic citizen. Such a desire is the one to pay the tax. Payment of tax is a civic duty and a contribution imposed by government for funding to enable her to run public services and perform other social responsibilities. (Adebisi & Gbegi, 2013, p. 125)

Although tax evasion and tax avoidance are facing problems every tax system, the Kosovo situation seems unique for the fact that the administration of taxes i.e. tax audit due to tax evasion and tax avoidance are mainly a result of the corruption of government officials and senior non-functioning of the law.

In this paper the issue of informality as a phenomenon which describes all economic activities which take place in secret by the state will be treated together with some of the negative phenomena that encompasses this phenomenon as tax evasion, tax avoidance, informal employment and wage understatement the workers. Problems that cause these phenomena and solving these problems are of great importance in terms of economic and social development. In general these phenomena reduce economic growth because tax avoidance reduces the ability of government to deliver social good for the citizens and thereby generate inequality between those who do evasion and those who pay tax, thereby contributing to the creation the motive for involvement in the evasion of other businesses, and in many cases even the salaries of workers understatement. Informality leads to unfair competition because informal businesses can sell their products and services at the lowest rate with low, because that their obligations are low by tax avoidance; informality reduces the chance of creating jobs in the formal sector, especially in countries where unemployment is high such as Kosovo, because of the fear that they will lose their jobs, the employees accept to work illegally in some cases their will, in many cases their minimal wages and working hours is due to longstanding struggle for survival. Besides causing negative effects on the economic development of the informal employment due to avoidance of income tax and

pension contributions of employees this category, except that in the future no pension benefits and health insurance, in fact in the long term it will raise the social cost for the state.

## 2. Informal Economy the Concept and Causes

A large part of the literature on informality explains the causes of this phenomenon to distribute not only in developed countries but also in developing countries or transitional. The concept of informality is complex and has sparked deep and controversial debate in academia. After reviewing recent literature that tries to define informality, it brings us to the question of whether this concept of including both activities is it legal and illegal. "Legal" includes unregistered business activities, which when caught can be formalized, but not extinct and bring additional revenue to the budget while, illegal activities include activities that should not exist; as human trafficking or drugs. These activities when are caught, cease to exist and do not bring additional revenue to the budget. (Riinvest Institute, 2013, p. 9)

According to Smith (1994, p. 18), the shadow economy comprises two types of activities, legal and illegal ones, the definition includes "products market goods or services, whether legal or illegal, are not included in the official measure of GDP".

While Friedrich Schneider (2008), defines the shadow economy as "all legal production of goods and services, in order to hide from the public authorities" thus leaving out the illegal economy and production activities of households. Therefore, the literature states that the informal sector is filled with terminological confusion.

The existence of an informal economy over time is explained by a variety of reasons, causes and motives related. Most analysts have agreed that one of the main causes in the development of the informal economy is the economic recession, as a consequence, of a possible stagnation unpleasant economic phenomena can occur such as unemployment, capital depreciation etc.

The main reasons to participate in the informal economy are mentioned in the literature: to avoid taxes; to avoid loss of government benefits; to avoid taxes, if earnings exceed a certain level, then individuals may take all or part of their benefits; a reaction from workers of firms and individuals of labor unions and the impact of international competition. For example, Swaminathan (1991) argues that the main reason to begin exploring in the informal sector in developing countries is associated with problems of poverty and survival needs. Also, in relation to countries in transition, Kaliberda and Kaufmann (1996) specify that the determinant of a growing informal economy fast are as follows: a portion of the low initial capital; a high degree of bureaucratic; corruption; civil war; market and

its mechanisms underdeveloped; low level of economic liberalization; high tax burden; Lack of confidence in government and macroeconomic instability. (Gërxhani, 2004, pp. 269-275)

As we have seen from the literature and the authors who have studied this phenomenon, we see that the illegal informal work identified mainly created to provide a salary (as self-employed or salaried employees) either to survive or to create additional income from salary and this leads us to the question: if the employees take informal jobs because you should or because they want to do this?, i.e. a word that informal work is voluntary or involuntary. According to Kucera and Roncolato (2008) informal employment differs from that of voluntary and involuntary this difference depends on the degree or state development. According to them, in developed countries where social security is great, the Employed may have alternative voluntary informal employment if they want to create additional income to take care lest the state while in developing countries where safety is low or absent for certain categories of people then involuntary informal employment is imposed. A similar conclusion is also given by Bernabe (2002) and Rutkowski (2006), who say the lack of opportunities to find work in the formal market and the need for survival in transition motivates people to work in the gray economy as the call them while in developed countries the informal activities intentionally developed so as to avoid taxation authorities as an opportunity for profit with high or for any other illegal purpose. While, Ruffer and Knight (2007) think that informality as voluntary as well as involuntary it can be applied in the same state and explain them as the growth of informality interpreted as economic failure and informal employment is considered imposed on the individual. In this case the growth of this sector is seen as a sign of economic success and then resolved by informal employment as will opportunities for profit with high (Riinvest Institute, 2013, pp.9-10).

According to a study done during the years 1999 to 2007 in 162 different countries of the world including developing countries and developed ones indicated that the presence of the informal economy as a percentage of gross social production averaged 34% in 1999, while it had a tendency decreases to 31% in 2007. Findings from the study also indicate that the high level of informality was present in the countries of sub-Saharan Africa 38.4%, followed mainly by the transition countries of Europe and central Asia with 36.5%, while in countries OECD high income with 13.5% of GDP. This shows that there are regional disparities in the level of informality. (Schneider, Buehn, Montenegro, 2010, pp. 3-34)

The informality of the labor force in Kosovo under an empirical study done in 2013 by the Riinvest Institute in Kosovo, the results show that on average 37% of the employed labor force is not legally declared.

### 2.1. Tax Evasion and the Factors that Caused It

The immediate effect and overall perception of tax evasion in many countries is the emphasis on the tax burden. Political and psychological effects arising from adverse reactions to taxpayers because the tax increase when they feel that mandatory fees are too high compared to their income they defer to tax evasion and fraud to be lowered their tax obligations. However, the size of the tax burden should not be viewed strictly as relative values in all countries. It is necessary to take into account the purchasing power of income remaining after tax for the room we encounter the same tax burden, but under different conditions (Dragomir, et al., 2011).

The mentioned factors cannot be considered as a cause of tax evasion in the case of Kosovo, given the fact that Kosovo has the lowest tax rates in the region and has a stable financial situation (but no rate with high poverty and unemployment in the region). This is shown in the IMF report for 2013, stating that Kosovo has shown considerable resistance to external turbulence, reaching one of the highest rates of growth in the Western Balkans during 2007-2012. This comes as a result of limited financial linkages and export to countries in crisis. Curb inflation remained at around 2%, 35% unemployment remains very high even though most of its mirrors informal employment. However tax structure should be adapted to the progress of European integration and the right over the economy towards domestic production taking into account the nature of the economy that relies heavily on imports and transfers, therefore government revenue collected from VAT too, excises and taxes on commercial activity (IMF, 2013 fq.1-5).

Tax harmonization is the main trend of fiscal policy to EU but, after the crisis of 2009 have a new trend for fiscal consolidation to reduce public deficit and liabilities held. Fiscal policy is very important for economic growth. If rates are increased or decreased, have some transmission channels of these measures of fiscal policy on the economy. So, if the government intends to stimulate investment tax rates should be lowered for the public budget this means a decrease. Global indicator which reflects the tax policy is the tax burden as measured by total tax revenue as% of GDP. This report is important because from a macroeconomic perspective reveals the government's success in collecting taxes and also the perception of the tax burden for contributors (Mara, 2012).

There is a big difference between Kosovo and the EU average in relation to the level of this indicator. The level of tax burden is low in Kosovo. The explanation is that tax collection in Kosovo is low even though the burden (rates) is lower taxes. Also, tax evasion is very high because taxpayers tend to hide taxes and do not pay tax in order not to reduce their profits.

A study done by UNDP in Kosovo shows that tax evasion reaches 39% (UNDP, 2012, f.53)

The tax burden weighs on mostly indirect taxes (VAT), about 45% of total taxes in the period 2012 to 2013 are from this tax, meeting and, in previous years to 50%, while the income tax personal gather around 33% of revenues and corporate tax (income tax) collected about 20% of taxes, others (tax on interest, dividends, royalties, rent, lottery winnings and gambling) about 3 % of taxes (Tax Administration of Kosovo, 2014).

While fiscal evasion is estimated to be the largest personal income tax for individuals under biggest filers of tax accounted for contractors, professionals such as lawyer, doctor, accountant, architect and traders at other stores unrealistic declare income, very low in compared with the nature of their businesses and, to their working Employed for wages, which are low in Kosovo, some of them do not declare tax on wages at a piece of under declaring it, in order not to reduce well-being of their already low. In low payment of tax on wages I thought that was influenced among other things by certain government decision only minimum wage to 170.00 € Employed over the age of 35 years old whereas the minimum salary of 130.00 € for the Employed under the age of 35 years old, which because of civil servants' salaries are relatively low in Kosovo have exploited this gap businesses in Kosovo, where a large part of their minimum wage claim for tax purposes for the Employed them even in those cases when they pay higher salaries for Employed them, a large part of their fare despite not declared will of those employees who are interested to pay tax on wages and pension contributions for their future. Pension Scheme in Kosovo is organized in a way that is individual pension accounts, so each gets employed when retiring pension amount which has accumulated (paid) for them. While tax companies hide posing major business expenses through fictitious invoices.

A very important feature of the tax system in many developing countries is the participation of consumption taxes or indirect taxes for reasons of lower administrative costs than their collection compared to the cost of collecting personal income tax and corporate. As documented by Gordon and Li (2009), consumption taxes constitute more than half of total government revenues in poor countries, personal income represent about 30%, whereas corporate income are 13% compared with 33 rates % of indirect revenue, 54% of personal income and corporate 10% those in developed countries. But regardless, the structure of income of a country relevant improvement of tax culture and sense of civic duty through greater budgetary transparency may be a more effective policy to improve tax collection and to promote economic growth. (Agenor & Neanidis, 2013, p. 1)

**Table 1. The Tax Burden in Kosovo and in the Region (the Balkans), (2012-2013)**

| No. | State | Value Added Tax | Tax on Profit | Personal Income Tax | Social Contribution |
|---|---|---|---|---|---|
| 1 | Kosovo | 16 % | 10 % | 4% 8 % 10 % | 10 % |
| 2 | Macedonia | 5 % 18 % | 0 % | 10 % | 27 % |
| 3 | Albania | 10 % 20 % | 0 % | 10 % | 27.9 % |
| 4 | Bulgaria | 7 % 20 % | 10 % | 5% 10% | 30.3 % |
| 5 | Monte-negro | 7 % 17 % | 9 % | 19 % | 33.8 % |
| 6 | Croatia | 5% 10% 25 % | 20 % | 12% 15 % 40 % | 35.2 % |
| 7 | Greece | 6,6% 13%23 % | 26 % | 10% 20% 22% 32% 42% | 44.5 % |
| 8 | Bosnia Herzegovina. | 17 % | 10 % | 5% 10 % | 31 % |
| 9 | Serbia | 8 % 20 % | 15 % | 12% 20% 25 % | 35.8 % |
| 10 | Romania | 5 % 9 % 24 % | 16 % | 16% 50 % | 44.2 % |
| Total | | 17 % | 12 % | 15,6 % | 27.6 % |

*Source: www.al-tax.org; www.atk-ks.org.*

As seen from table tax burden in Kosovo, is generally lower than the average tax burden in the region. Since, in Kosovo so far applied only a tax rate on value added tax 16%, and it is low compared with higher rates that apply in other countries of the region and is also lower than the average of the region. Profit tax except Macedonia and Albania that is not quite applicable, Montenegro has lower rate than Kosovo for 1 % and rates are equal to Kosovo and Bosnia-Herzegovina Bulgaria, other countries have a higher rate and yet Kosovo has rates lower than the regional average for this type of tax. While terms of the personal income tax and pension contributions Kosovo has low tax rates in the region.

**Table 2. The Tax Burden in the European Union Countries (EU)**

| Value Added Tax (VAT) rates in the EU -27 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year: | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
| % | 19.2 | 19.3 | 19.5 | 19.5 | 19.4 | 19.5 | 19.4 | 19.5 | 19.4 | 19.8 | 20.4 | 20.7 | 21.0 | 21.3 |
| Top Personal Income Tax rates in the EU-27 | | | | | | | | | | | | | | |
| Year: | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
| % | 44.8 | 43.8 | 43.0 | 42.3 | 41.3 | 40.0 | 39.4 | 39.2 | 37.9 | 37.2 | 37.9 | 37.6 | 38.1 | 38.9 |
| Corporate Income Tax rates in the EU-27 | | | | | | | | | | | | | | |
| Year: | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
| % | 31.9 | 30.7 | 29.3 | 28.3 | 27.0 | 25.5 | 25.3 | 24.5 | 24.0 | 23.9 | 23.3 | 23.1 | 23.0 | 23.2 |

*Source: Commission Services (European Commission, Eurostat, 2013, pp. 31-38)*

As seen from the table above, the value added tax in EU countries in 2013 has increased by 2.1% compared with 2000. The personal income tax has fallen from 5.9%, whereas, Tax Corporate Income has decreased with of 8.4% in 2013 compared with 2000 in the EU countries.

Whereas, if we compare the tax rates applied in EU countries with the Kosovo case we see that the tax burden in the value-added tax in 2013 is 5.3 points lower in Kosovo than the average of the EU countries. Personal income tax in Kosovo in 2013 is 34.5 points lower than the average of the EU tax and corporate income (profit tax) in Kosovo in 2013 is lower than 15.9.pikë the average of the EU countries.

The tax burden in the Balkans in 2012 is 30.3% on average as of BPB. 2013 is 30%, i.e., a reduction of tax burden of 0.3% points (Gjokutaj, pp. 8-10).

In 2011 the tax burden including pension contributions in the 27 member states of the EU was 38.8% of BPB, the Eurozone (EA -17) was 39 .5%, in the United States of America (USA) and 25.2%, Japan 28.7% (European Commission, 2013, p. 21).

Although to indirect taxes (VAT) evasion opportunity to say that it is small because most of his harvest at the border, it still possibility for VAT evasion is evident mainly in domestic sales with VAT, i.e. even though the tax on VAT is an indirect tax and the burden falls on the ultimate consumer is nevertheless taxpayers are inclined to hide it by issuing fictitious invoices.

## 3. Tax Evasion and Corruption

Taxation is associated with the state in two respects: There is connection between taxation and accountability from the state on one hand and the relationship between the tax and state capacity on the other. To meet these working relationship with citizens to pay more taxes require many state services in return therefore, increase public revenues through taxation normally increase citizens' demand for a government to be responsible and incorruptible also very important is listening sonic the citizens how they perceive taxation and government efforts to increase taxes because raising taxes on one side and government irresponsibility on the other hand push tax contributors increasingly towards tax evasion. So, good governance, increase citizens' trust in public institutions and citizens to respond postpones paying taxes voluntarily and under conditions of poor governance, public income citizens can resist their payment if they believe that the tax system is very illegal and immoral as an arena where there are no rules encouraging them to avoid taxation through various strategies, especially when considering that the

country is in the grip of corruption introduced absorption by public officials. Impunity of public officials who are reduced to pardon influential in the hands of citizens who put their trust in many countries mainly in developing countries instead of being vested in the state that corruption has to be a phenomenon increasing even with tax evasion (Orock & Mbuagbo, 2012, pp. 480-482).

Based on the data (surveys conducted by businesses) Riinvest Institute in Kosovo appears that the major barriers to doing business in Kosovo are: tax evasion and informality that ranked first and second barrier in doing great business is corruption and data comparing 2013 with 2011, it appears that their impact is significantly increased compared to 2011. (the survey found that most businesses have declined in sales by unfair competition, the same found that most of sales realized in the country primarily to household customers while very little is exported and that businesses believe more staff, suppliers and buyers than government institutions and relevant municipality ie (Riinvest Institute, pp. 5-16).

Apart from the limited capacity within the Tax Administration for tax collection time, often ambiguities in the interpretation of the law (which are adapted from other countries) and the assessment of damage causes the tax burden for businesses that end up paying the fine because they have not been better able to calculate their tax liabilities. For more uncertainties in implementation increase the cost in time and money and opportunities for corruption.

According to the UNDP (2014), although corruption remains a phenomenon whereby Kosovo society is concerned, has decreased the percentage of citizens who think that corruption is present scale in various institutions, compared with April 2013. Perceptions of corruption in the Tax Administration of Kosovo, according to this report in April 2013 were of 42.5%, while corruption in April 2014 is of 16.5%.

## 4. The Culture of Paying Taxes (Tax Morale) in the Context of Fiscal Policy

Paying taxes throughout history has been and will be spent on the crucial role of fiscal policy as it forms the basis of the state to work. Therefore, it is very important to analyze tax morale. It can be assumed that no one likes to pay taxes even though everyone knows that taxes are essential for the government. There are some important tools that help to explain non-compliance or compatibility with taxes. Many researchers have pointed out that tax morale than first seen as internal motivation to pay taxes affected by many factors such as socio-demographic, socioeconomic, national or religious pride of a society; secondly institutional arrangements by which government works as democratic participation rate of

citizens (taxpayers) in government decisions, the degree of decentralization of taxation and the level of institutional trust, the tax administration behavior Thirdly, the effectiveness of the administration and its behavior towards taxpayers and the size of the tax burden are crucial for people to pay tax or not. So, as deemed tax evasion is not only illegal activities but is related to fiscal policy decisions by the government, bringing tax officials and cultural aspects therefore not only the level of law enforcement, but also the level of tax morale is crucial to understand the behavior of citizens and their willingness to pay taxes for tax morality seen tied to economic justification of taxation it is crucial how the government taxes the economy and how the government spends these revenues (Torgler & Schaltegger, 2006, pp. 1- 3).

The government to perform certain functions of its administration, and among other things it needs: Collection of resources from the economy, in order to sufficient and adequate and the distribution and use of these resources responsibly, efficiently and effectively. (OECD, 2004, p. 17)

As pointed Musgrave (1959) that the three requirements of fiscal policy are: revenue collection, their distribution and stabilization of the economy where the first two aspects are of interest to tax morale because the size of the income depends on people's compliance to paying taxes, income distribution also based on the principles of equality, justice and transparent manner positively affects tax payment. (Torgler & Schaltegger, 2006, p. 3)

A study done by Adebisi and Gbegi shows that enlightenment of the citizens to pay taxes and use adequate tax revenue for public goods and services would discourage tax avoidance and tax dodgers, while higher rates of tax avoidance and tax evasion urges that dodgers. The biggest problem faced by the tax systems in each country are the problem of tax evasion and tax avoidance. While fiscal evasion is the intentional violation of the law and deliberately to avoid paying tax which is imposed by law tax jurisdiction, tax avoidance is the way by which the taxpayer actively seeks to reduce or remove entirely the responsibility of its true tax without breaking the law (Adebisi, & Gbegi, 2013).

The first studies related to tax compliance were made in 60 and 70 by German researchers that psychology school tax Cologne. They saw tax morale as an attitude about tax compliance Schmolders (1960). Polls showed that the weight of their taxes is an indicator for the level of tax morale and found that self-employed people have morals with lower taxes than Employed, while Strumpel (1969) emphasized that the treatment of taxpayers with great care helps the cultivation of morality taxes (increasing the level of tax morale) and reduce tax compliance costs. So, as mentioned above socio demographic factors are sensitive site factor affecting tax morale ranging from important variables such as age, gender and

education. In this respect Tittle (1980) argues that the elderly are susceptible to threats of sanctions, so they are less prone to tax eliminated, but also in terms of gender Tittle (1980) shows that women are less inclined to avoid taxes because they are less independent than men, and if this is correct then such a definition does not apply today because women are now more independent than previous generations. Also, the level of education has an impact on morale taxpayers tax because taxpayers know better educated tax laws also are aware of the benefits of the services that the state provides to citizens, also better understand the possible abuses of government and know be critical to how the state uses tax revenue therefore affects the level of education of tax morale. (Torgler & Scholtegger, 2006, pp. 11-17)

Apart from socio demographic factors and socio economic level of tax morale have said that affects trust in government decisions and actions, then the government could promote confidence in the taxpayer if it creates a good reputation. An effective tax system should be feasible in order to provide incentives for taxpayers, they pay taxes, a form of the stimulus would be faith in the government that the resources collected from the payment of taxes will return to providing services to citizens and will not be misused by government officials. Tax affects the economic growth process since if it generates annually increased resources to finance the supply of production inputs provided by the government in the form of public goods such as roads or public education. (Caballe & Panades, 2000)

Also, the willingness to pay more taxes also affects the behavior of the tax authorities to taxpayers. If tax officials behave correctly and justice and fairness and respect for taxpayer services then provide the level of tax morale will increase and decrease together with the cost of collecting taxes, in contrast rude treatment will reduce tax morale while the cost of collecting taxes will increase because businesses need to audit will be great and will be done as a rule in place that would be much less necessary.

Empirical Analysis of the Frey (2003) has shown two important aspects of treatment with respect to taxpayers: first transparency of procedures used by the tax authorities. If the procedures are clear and open communication from state officials, easily understood by the taxpayer, then the willingness to pay taxes is great and secondly in the context of treatment and equal respect taxpayers role mode of treatment between taxpayers honest and dishonest. Treatment of honest taxpayers if they have made small mistakes on the occasion of the handover of their tax statements should not be treated as a criminal offense of intentional tax fraud just as dishonest taxpayers because the tax morale of honest taxpayers would then be damaged. (Torgler & Schaltegger, 2006, p. 21)

Regarding the determinants of tax morale aforementioned respect to the case of Kosovo, the Kosovo Tax Administration has made a series of reforms focusing on improving the quality of services for consumers, transparency and process improvement. Reforms and regulations including tax laws where tax laws applicable in Kosovo are new and most copied from various countries of the world and some of them were in disharmony with economic conditions in Kosovo, as the current tax system is re-established after the war in 1998/1999 and built with the help of international, so for 15 years to what has hitherto system of Kosovo tax laws and guidelines have changed from time to time that has caused great difficulties for taxpayers since that time had time to cope with new regulations and procedures for the settlement of their tax liability. It should be noted that frequent changes to regulations that are now translated into laws have found it difficult even tax officials who all the time had to cope with changes in laws and procedures at the same time also be their enforcer, who in some cases there may also bring uncertainty to taxpayers and at the same time stimulating their nonpayment of taxes. In the past two years has developed an electronic system where taxpayers are obliged to declare their taxes electronically that you thought was a hasty step of the tax authority because not all taxpayers are aware to understand how such a system when consider the complexity of the system and low level of education of a considerable number of people involved in the business. Number of people involved in business in Kosovo is great even though the possibilities of doing business are small and challenging because of government incentives are very limited to say non-existent (they exist only on paper), but people in Kosovo entering to conduct business in the absence of a job because the unemployment rate is calculated very high around 40%. So his way of declaring taxes in the last two years will be cause taxpayers who pushed for fiscal evasion, the impact is huge, especially in the tax declaration salaries of employees who also has been concerned with tax avoidance and fiscal evasion due to low salaries. So the way the tax declaration according bring cost system that applies to taxpayers in Kosovo and pushes them to avoid taxes that simultaneously causes the cost to the tax authority, which should focus on surveillance activities that avoid the tax payers or do not declare all; in auditing taxpayers to determine undeclared tax or avoid, and causes costs in collecting overdue taxes and penalties. Also, tax avoidance and tax evasion in business income in Kosovo is considered to be great when considering data (facts) on the ground that brings undeclared tax as well as additional tax on the occasion of audits (controls) that become these businesses by tax officials. In most cases tax avoidance observed in the value added tax (VAT) or consumption tax otherwise called but the difference here is that their transactions are easy to investigate and determine the tax evaded. So this means that tax evasion and tax avoidance in Kosovo is high and thus the need for additional staff to tax officials as level of tax compliance is low.

Agha and Haughton provided an overview of fiscal evasion of VAT in different countries of Europe and showed that example. In the late 70's 40% of revenues from VAT were uncollected, one-third of businesses have avoided some of the VAT, while the audit report in 1984 in France shows that two thirds of businesses audited had underestimated the value of taxable sales. Overall results show that Agha and Haughton compliance or compliance of taxpayers to pay VAT increase at a lower rate of VAT, they also concluded that a single rate tax with a broad base is ideal for a positive response to taxpayers for payment of VAT (Agha and Haughton, 1996, p. 307).

A single rate of VAT with a broad base is applicable in Kosovo, which is 16% of the value of goods imported and domestic purchases and sales, while 0% is the rate of VAT for export of goods.

## 5. Conclusions and Recommendations

As discussed previously, tax evasion is a complex phenomenon and largely present in all types of economies, poor, developing and developed. Given its complexity has many obstacles to overcome in order that the phenomenon of tax evasion and the informal economy generally be controlled as well as its consequences on the official economy of Kosovo to be analyzed and it is known that reduced its size to a value high.

Also, it was found that people engage in informal activities for a variety of reasons. These are not reasons in Kosovo due to the high tax burden because they are very low but, are in response to the low level of economic and social development, in response to the actions of the government and its officials, which is immersed in corruption and rule of law is weak, and for a fraction of taxpayers who realize huge profits mainly from service activities tax avoidance is not due to their awareness of tax payment and the failure to successfully adequate techniques for their treatment. Kosovo Government should take effective measures leading to stabilization or reduction of informal economy through incentive-oriented policies in a way that will make the work attractive in the official economy, especially in the creation of jobs, improvement in collection management tax revenues, which will reflects the growth and welfare of the citizens in general. Major problems, faced by Kosovo's tax system is to tax administration tax audit respectively due to tax evasion and tax avoidance, which are mainly due to the high corruption of government officials and non-functioning of the law. Therefore it is recommended that:

- The rule of law to prevail in Kosovo in order to combat negative phenomena including corruption of government officials and then the other occurrences as the informal economy.

- The development of appropriate techniques for handling more closely, not tax payers obligations, in particular in the construction sector, professionals of different profiles and to the private sector Employed.
- Capacity building of human resources in the Division of Risk Management for the aforementioned non-payers.
- Equal treatment of taxpayers.
- The fight against tax evasion should be implemented in such a way that improves competitiveness.

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# A Study on Predictor Variables of Organizational Climate in Educational Institutes

**Gudivada Venkat Rao**[1]

**Abstract:** The Organization Climate is a fancied term which is relevant at any point of time and is transient. The contextual reference of Organizational Climate is made for its ability to attract, retain and nurture talent. But, even though higher education in India is important; it failed to attract the best talent. The Organizational Climate and its contents were subjected to further scrutiny in this paper in Institutes of Higher Education in Visakhapatnam. The study examines the profile factors and their influence on the components of Organizational Climate. Further, the intra and inter relationships were also tested. The results show direction to the practioners for improving the significant influencing factors. The sample of 150 faculty members was drawn from five Institutes of Higher Education in Visakhapatnam. The human resources practices relating to Working Conditions, Job Design, Performance Management, Compensation, Relations, Communications, Training and Development, Objectivity and Rationality, Grievance Handling and Welfare were considered for estimating the organizational climate. The multi-regression and mean analysis find organizational climate as moderate. The gender diversity and female influence were there in the Educational Institutes. However, Compensation has a very low mean. The Performance Management, Objectivity & Rationality and Relations were found to be the major influencers.

**Keywords:** organizational climate; culture; working conditions; compensation; performance

**JEL Classification:** J28

## 1. Introduction

The Organization Climate is a fancied term which is relevant at any point of time. Many organizations conduct surveys periodically to assess the effect and effectiveness of the human resources practices in any type of organization viz. manufacturing and service. The academicians were keen to examine the content and relationship of organizational factors. Porter (1961) conducted surveys on Organizational Climate and its predictor variables. There are variations in understanding the term Organizational Climate at micro level and macro level. Further due to its transient nature it is taken as measuring metric for an organization at a particular point of time. The organizations in manufacturing or services are counting on their human resources and their competencies for

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competitive advantage. The ability of Organizational Climate to attract, retain and nurture talent is new area were not much studies were conducted.

Keith Davis (1975) say's organizational climates is the totality of its culture, tradition and methods of action of the human environment within which an organization's employees perform work. Seyder, R. A., and Benjamin Schneider (1975) view organizational climate as an experience, common phenomenon and a global expression of the organization. Don Hellriegal and Slocum, J. W. (1974) defines organizational climate as a set of attributes which can be perceived about a particular organization and or its sub systems by its members. Payne R L and Pugh (1976) say's organizational climate as concept reflects the content and strength of the prevalent values, norms, attitudes, behavior and feelings of the members of a social system. Litwin, G. H., and Stringer, R. A. (1966) "it as a set of measurable properties of the work environment, perceived directly or indirectly by the persons who live and work in that environment".

The Organizational Climate and Culture are the other areas were much clarification is required. Udai Pareek (2007) explains the difference at three levels 1.values, ethos 2.climate and 3.culture. Some feel no difference between organization culture and climate (Mile & Schmuck, 1970; Gellerman, 1968). Organizational climate is an assessment of organizational outlook, attitudes, belief, norms, value etc. (Keith Davies, 1975; Woodman and King, 1978); some authors feel it is a comparative term for distinguishing the organizations and industry. Smitha Das (2009) say's organizational climate is the collective personality of a system, characterized by the social and professional interaction within it. Two organizational climates exits, one at individual level and the other at organizational level (Woodman and King, 1978; James and Jones 1974). The individual perceptions of policies, practices and procedure is known as psychological climate and summation of shared perceptions of all these individuals is organizational climate(Udai Pareek,2007;James& Ashe ,1990;Reichers & Schneider,1990). The summated climate for Burke, Borucki & Hurley (1992) is human relations climate whereas Schneider, White & Paul (1998) terms service climate as sub-system of organizational climate. Brown & Leigh (1996), Neal & Griffin (1999) has concluded organizational climate like Human Resources Management is an important determinant of organizational effectiveness and productivity. The work performance subsequently is influenced by the individual behavior and Youndt, Snell, Dean & Lepak (1996) predict that organizational climate has an impact on performance. The organizational climate is propelled by the individual behavior.

### 1.1. Components of Organizational Climate

Litwin and Stringer (1968) analyzed the organization in macro perspective using systems. The six motives are 1. Achievement 2. Influence 3. Control 4. Extension 5. Dependency 6. Affiliation. Schneider & Barlett (1968) examined the organizational climate with 1.Involvement 2.Co-Worker 3.Cohesion 4.Supervisor Support 5. Autonomy 6. Task Orientation 7. Work Pressure 8. Clarity 9. Managerial Control 10. Innovation and 11. Physical Comfort as factors. Hellriegel & Slocum (1974) have used the following constituents 1. Communication 2. Values 3. Expectations 4. Norms 5. Policies and Rule 6. Programs 7. Leadership to evaluate the organizational climate.

Likert (1967) proposed the following as six dimensions of organizational climate 1. Leadership 2. Motivation 3. Communication 4. Decisions 5. Goals and 6. Control. Udai Pareek (2004) in his explanation says six motives and twelve processes shape the climate of an organization. The twelve processes are 1. Orientation 2. Interpersonal Relationships 3. Supervision 4. Problem Management 5. Management of Mistakes 6. Conflict Management 7. Communication 8. Decision Making 9. Trust 10. Management of Rewards 11. Risk Taking 12. Innovation and Change. The six motives which influence the shape of organizational climate are 1. Achievement 2. Influence 3. Control 4. Extension 5. Dependency 6. Affiliation. The Organizational Climate construct of Lawler E Hall, D., & Oldham G. (1974) is combination of positive and negative features and it comprises of 1. Competent 2. Responsible 3. Practical 4. Risk-Oriented and 5. Impulsive. Dieterly, D. & Schneider, B, (1974) made a construct to examine the perceived organizational climate with a measure of 1. Individual autonomy 2. Position structure 3. Reward Orientation and 4. Consideration.

Organizational climate is the collective personality of a system that is characterized by the social and professional interactions within it. The factors of organizational climate are not clear and different researchers experimented with options. Climate is a phenomenon that is influenced by both the internal and external environments. The climate is durable and lasting but it changes over a period of time due to internal and external influences. Further, Organizational climate may be viewed as summation of the shared perceptions or Individual perceptions of organizational attributes.

Udai Pareek(2007) concludes Organizational Climate as concept may be analyzed at different level viz., individual is the organizational unit ,role is the organizational unit, teams and inter-teams is the organizational unit, organization is itself the unit and combination of organizations in a industry as unit.

## 2. Empirical Studies

Some studies on the relationship between profile factors, employment factors and organizational climate were reported to be conducted on college campus. The school climate and its relation to innovation was researched by Bennett (1969) on a sample drawn from high schools in America and found a higher positive relationship in both number and types of innovations in the more open types of climate. The studies of Schneider & Bartlett's (1970) concluded with similar findings in explaining the levels in the hierarchy and organizational climate. Perrow (1970) examined combining samples from various organizations to study organizational levels with organizational culture and climate, his studies found similar results for all the organizations.

Further, studies by Payne & Mansfield (1973) on organizational climate found variations in climate scores with respect to hierarchy. The group culture invariably influence the perception an individual holds of an organization, the same results were found by Gregory (1983) in a study on group culture in colleges and universities. The organizational climate is a construct with several factors and has relationship with job satisfaction, job performance, communication, leadership, structure and commitment (Ansari, Baumgartel & Sullivan, 1982; Likert, 1961and Austin 1987). Thomas Moran & J Fredricks Volkwein (1988) has found in his studies that Climate has relationship with the organizational level in educational institutes and concluded that administrative sub-units have significantly more positive perceptions of organizational climate than faculty. Hoy & Miskel (2001) in their study found both task oriented and relations oriented style as effective in a healthy school climate with dynamic leadership. Wynn & Carboni (2006) reported, teachers are more likely to remain in the profession when they are satisfied with the leadership and with the climate. The school climate was researched by Halpin & Croft (1963), has held the relationship among group members and the relationship between management and teaching staff are invariably influencing the organizational climate.

Some foreign research works exists in education sector. In India, empirical reviews on organizational climate in schools, colleges and universities are not many, the university level is different from university affiliated colleges level, some empirical studies were reported but these are inconclusive. The factors of organizational climate were not uniformly used by the researchers. However, Objectivity and Rationality, Compensation, Grievance Handling, Working Conditions, Performance Management, Training and Development, Communications, Welfare, Relations and Job Design as factors were not comprehensively examined by different researchers.

The importance of organizational climate to the organization is clearly established in the empirical studies. The Educational Institutes play an important role in nation development but empirical literature is available only in school environment and little literature is available on prevailing organizational climate in Institutes of Higher Education.

## 3. Method

The present study is done to answer some of the areas mentioned in the research agenda. Climate is transient and way of process and style. The human resources practices and the concepts were reconceptualized and the following factors, 1.Working Conditions, 2. Job Design 3. Performance Management, 4. Compensation, 5. Relations, 6. Communications, 7. Training and Development, 8. Objectivity and Rationality, 9. Grievance Handling and 10. Welfare were considered for estimating the organizational climate.

### 3.1 Objectives of the Study

The research was initiated to meet the following stated objectives.

1. To understand the construct and profile of the faculty in private institutes of higher education relating to demographic and socio-economic variables.
2. To estimate the organizational climate in institutes of higher education in private affiliated institutes in Visakhapatnam.
3. To examine the content and factors of the organizational climate.
4. To examine and analyze the relationship between the profile and employment variables with organizational climate factors.
5. To estimate the extent of influence of organizational climate factors on the overall organizational climate.

### 3.2. Hypothesis

1. The organizational climate was influenced by profile and employment factors positively and comprehensively.
2. The organizational climate factors are influenced by each other.

The study was undertaken in the educational institutes offering higher education in the city of Visakhapatnam, India. Further, the sample is made from five private educational institutes offering post-graduation education in management, science and humanities. The five institutes are selected randomly from the list of affiliated colleges in Visakhapatnam under the Andhra University. The private institutes are

supposed to implement Human Resources Practices as per Conditions of Service framed by the Andhra University for affiliated post graduated colleges as per University Grants Commission guidelines. The names are not revealed at the request of the participating Institutes. The representative sample is drawn from faculty members in five private educational institutes (Table 1). The multi-regression analysis was applied along with descriptive statistics in a systematic manner to prove the hypothesis.

## 4. Results

The collected data is tested using Cronbach's Alpha reliability test. The Cronbach Alpha (Table 2) coefficients for socio-economic variables, organizational climate variables and total variables are 0.6531, 0.8630 and 0.8236 respectively.

**Table 1. Distribution of Sample**

| Institute | Sample | Percent to Total |
|---|---|---|
| 1 | 54 | 36.0 |
| 2 | 14 | 9.3 |
| 3 | 13 | 8.7 |
| 4 | 11 | 7.3 |
| 5 | 33 | 22.0 |
| 6 | 25 | 16.7 |
| Total | 150 | 100.0 |

**Table 2. Cronbach's Alpha**

| Socio-Economic Variables | | Organizational Climate Variables | | Total Variables | |
|---|---|---|---|---|---|
| No. of Items | Alpha | No. of Items | Alpha | No. of Items | Alpha |
| 17 | .6531 | 32 | .8630 | 49 | .8236 |

The Cronbach Alpha above 0.60 is generally considered as reliable for the studies of this magnitude. The size of the sample is above 100 and generally large samples have normal distribution on a normal curve.

### 4.1 Socio-Economic and Employment Profile

We find substantial presence (87.5 per cent) of the respondents in 20- 40 years age group (Table 3). We find only 10 per cent and 2.7 per cent in 40-50 years and 50 years and above age group respectively. In educational institutes female participation is high (58.0 per cent) and is in majority in comparison to the males (42.0 per cent). The same Gender- Age analysis of educational institutes reveals that within 20- 30 age group 31.9 per cent are males and 68.1 per cent are females. Similarly, within 30 – 40 years age group males and females are evenly distributed.

**Table 3. Gender - Age Classification**

| Gender | Age in Years | | | | Total |
|---|---|---|---|---|---|
| | 20-30 | 30-40 | 40-50 | 50 and above | |
| Male | 22 | 31 | 8 | 2 | 63 |
| | 31.9% | 50.0% | 53.3% | 50.0% | 42.0% |
| Female | 47 | 31 | 7 | 2 | 87 |
| | 68.1% | 50.0% | 46.7% | 50.0% | 58.0% |
| Total | 69 | 62 | 15 | 4 | 150 |
| Percent within Age | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Percent within total | 46.0% | 41.3% | 10.0% | 2.7% | 100.0% |

The nativity trends in educational institutes show (table 4) that 51.3 per cent are from outside Visakhapatnam and 61.3 per cent are domicile of other urban areas. In educational institutes 52.4 per cent males and 46.0 per cent females as a percentage of gender belong to Visakhapatnam. Further, 47.6 per cent and 54 per cent as a percentage of gender do not belong to Visakhapatnam. In educational institutes, among the faculty 42.0 per cent are engaged in teaching, 2.0 per cent in Laboratory, 6.7 per cent in teaching and administration, 44.0 per cent in teaching and laboratory and 5.3 per cent in all the above mentioned activities(Table 5). Based on specialization, the distribution (Table 6) is computer science (28.7 per cent), Management Studies (34.0 per cent).

**Table 4. Nativity – Gender**

| Nativity | Gender | | Total |
|---|---|---|---|
| | Male | Female | |
| Visakha-patnam | 33<br>52.4% | 40<br>46.0% | 73<br>48.7% |
| Non-Visakha-patnam | 30<br>47.6% | 47<br>54.0% | 77<br>51.3% |
| Total | 63<br>100.0% | 87<br>100.0% | 150<br>100.0% |

**Table 5. Nature of Duties**

| Duties | Frequency | Percent |
|---|---|---|
| Teaching | 63 | 42.0 |
| Laboratory | 3 | 2.0 |
| Teaching and Administration | 10 | 6.7 |
| Teaching and Laboratory | 66 | 44.0 |
| All | 8 | 5.3 |
| Total | 150 | 100.0 |

Science (25.3 per cent), and Other Courses (12.0 per cent). Further the designation wise distribution is Lecturers (34.0 per cent), Assistant Professors

(52.0 per cent), Associate Professors (8.00 per cent ), Professors(4.7 per cent ) and Lab Incharges(1.3 per cent). Therefore, majority of the respondents (86.0 per cent) are in the Lecturer and Assistant Professor Group.

**Table 6. Classification - Specialization**

| Specialization | Classification | | | | | Total |
|---|---|---|---|---|---|---|
| | Lecturer | Assistant Professor | Associate Professor | Professor | Lab. Assistant | |
| **Computer Science** | 12 | 25 | 2 | 2 | 2 | 43 |
| | 27.9% | 58.1% | 4.7% | 4.7% | 4.7% | 100.0% |
| **% within specialization** | 23.5% | 32.1% | 16.7% | 28.6% | 100.0% | 28.7% |
| **% within classification** | 8.0% | 16.7% | 1.3% | 1.3% | 1.3% | 28.7% |
| **% within total** | | | | | | |
| **Management Studies** | 21 | 22 | 4 | 4 | | 51 |
| | 41.2% | 43.1% | 7.8% | 7.8% | | 100.0% |
| **% within specialization** | 41.2% | 28.2% | 33.3% | 57.1% | | 34.0% |
| **% within classification** | 14.0% | 14.7% | 2.7% | 2.7% | | 34.0% |
| **% within total** | | | | | | |
| **Science** | 11 | 22 | 5 | | | 38 |
| **% within specialization** | 28.9% | 57.9% | 13.2% | | | 100.0% |
| **% within classification** | 21.6% | 28.2% | 41.7% | | | 25.3% |
| **% within total** | 7.3% | 14.7% | 3.3% | | | 25.3% |
| **Other Courses** | 7 | 9 | 1 | 1 | | 18 |
| **% within specialization** | 38.9% | 50.0% | 5.6% | 5.6% | | 100.0% |
| **% within classification** | 13.7% | 11.5% | 8.3% | 14.3% | | 12.0% |
| **% within total** | 4.7% | 6.0% | .7% | .7% | | 12.0% |
| **Total** | 51 | 78 | 12 | 7 | 2 | 150 |
| **%within specialization** | 34.0% | 52.0% | 8.0% | 4.7% | 1.3% | 100.0% |
| **% within classification** | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| **% within total** | 34.0% | 52.0% | 8.0% | 4.7% | 1.3% | 100.0% |

**Table 7. Classifications (Faculty) – Gender**

| Classification | Gender | | Total |
|---|---|---|---|
| | Male | Female | |
| Lecturer | 11 | 40 | 51 |
| | 17.5% | 46.0% | 34.0% |
| Assistant Professor | 40 | 38 | 78 |
| | 63.5% | 43.7% | 52.0% |
| Associate Professor | 6 | 6 | 12 |
| | 9.5% | 6.9% | 8.0% |
| Professor | 4 | 3 | 7 |
| | 6.3% | 3.4% | 4.7% |
| Lab. Assistants | 2 | | 2 |
| | 3.2% | | 1.3% |
| Total | 63 | 87 | 150 |
| | 100.0% | 100.0% | 100.0% |

In educational institutes, based on faculty designations the classification (Table 7) within males follows Lecturers (17.5per cent), Assistant Professors (63.5 per cent), Associate Professors (9.5 per cent), Professor (6.3 per cent) and Laboratory Incharge (3.2 per cent). And within females the distribution is Lecturers (46.0 per cent), Assistant Professor (43.7 per cent), Associate Professor (6.9 per cent) and Professor (3.4 per cent). In educational institutes, 62.7 per cent are having less than 5 years of service. The distribution of the respondents with more than 20 years of service is 1.3 per cent, and less than 10 years of service is 88 per cent. The faculty members' specializations within the males are analyzed. The results show 36.5 per cent, 30.2 per cent, 19.0 per cent and 14.3 per cent have specialization in computer science, Management Studies, Science and Other humanities courses respectively. Majority (66.7per cent) of the female faculty are in Management and Science. Further, representation of females in Computer Science and Other Humanities Courses are 23.0 per cent and 10.3 per cent respectively. Majority of the male faculty are in Computer Science and Management. The salary profile of the respondents in the educational institutes on analysis reveals that 86.7 per cent are learning below US $334 per month. Further, within the males and females 81 per cent and 90.8 per cent are drawing less than US $334 per month.

## 4.2 Collinear

The collinear values (Table 8) establish the independence of the variables and all the diagonal values in organizational climate matrix are unity with other values tending towards unity. The working conditions (x: 3.43) is the most influencing factor followed by Performance Management, Relations, Welfare, Objectivity &

Rationality. The Compensation(x: 2.67) is the lowest influencer within the organizational climate. The factors are independently correlating with each other positively except Welfare which is negatively correlated with Job Design. Further to understand the relationship within the Organizational Climate Factors multiregression analysis was applied. The following multi regression analysis model is used.

$$Y = a + bx_1 + cx_2 + dx_3 + ex_4 + fx_5 + gx_6 + hx_7 + ix_8 + jx_9 + kx_{10} + \text{error}$$

Y = Dependent Variable i.e. one of the factors of organizational climate.

$X_i$ where i takes values from 1 to 10 for other factors of Organizational Climate. Where a,b,c,d,e,f,g,h,i ,j, and k are the coefficients. Similarly, each of the factors is made dependable with other factors as independent variables for all the factors of Organizational Climate.

The Working Conditions as a dependable variable is explained to the extent of 18.6 per cent by two variables. The variations in Objectivity & Rationality are explained by five variables to the extent of 56.3 per cent. The Performance Management, Relations and Objectivity & Rationality explained 52.9 per cent variations in the Communication. In Educational Institutes, Objectivity & Rationality and Communications are the important factors. The Compensation factor with low mean is influenced by only two factors Performance Management and Welfare to the extent of 31.4 per cent. The F-test for each of the model is significant suggesting appropriateness. Thus, the second hypothesis is true.

**Table 8 Collinear and Descriptive Statistics of Organizational Climate Variables**

| | Mean | S.D. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 3.43 | .81 | 1.00 | | | | | | | | | |
| 2. | 3.16 | .90 | .133 | 1.00 | | | | | . | | | |
| 3. | 3.38 | .81 | .208 | .042 | 1.00 | | | | | | . | |
| 4. | 2.67 | .88 | .072 | .050 | .262 | 1.00 | | | | | | |
| 5. | 3.34 | .79 | .236 | .032 | .160 | .114 | 1.00 | | | | | |
| 6. | 3.07 | .77 | .195 | .174 | .244 | .217 | .347 | 1.00 | | | | |
| 7. | 3.13 | .82 | .253 | .067 | .211 | .339 | .268 | .486 | 1.00 | | | |
| 8. | 3.29 | .80 | .247 | .042 | .341 | .454 | .458 | .408 | .517 | 1.00 | | |
| 9. | 3.10 | .76 | .385 | .111 | .400 | .214 | .257 | .476 | .435 | .434 | 1.00 | |
| 10. | 3.34 | .88 | .213 | -.026 | .155 | .421 | .357 | .196 | .509 | .530 | .386 | 1.00 |

Note: variables are arranged according numbers mentioned elsewhere in paper

In the next stage, the relationship between organizational climate factors and profile factors in educational institutes was examined by applying multiple regressions. Each factor of the Organizational Climate is regressed with profile

factors viz., Age, Gender, Caste, Nature of Education, Nature of Work, Salary, Classification and Service. The profile factors are a combination of personal identity and employment identity. The multiple regression model is based on the equation

$Y= a + bX_1 + cX_2+ dX_3+ eX_4 + gX_5 +hX_6 +iX_7 + u$

Y = Dependent variable i.e. one of the factors of organizational climate.

$X_1$ = Age, $X_2$ = Gender, $X_3$ = Caste, $X_4$ = Nature of Education, $X_5$ = Salary, $X_6$ = Classification

$X_7$ = Service .Where a, b, c, d, e, f, g, h and i are constants and u is the error term.

**Table 9. Significance Table of one organizational climate factor on other organizational climate factors**

| **Dependent OC variable variable** | **Independent OC Variable Which is Significant** | **F-test of the model** | **$R^2$** | **t Value** |
|---|---|---|---|---|
| 1. Working Conditions | 1.Job Design<br>2.Relations | Signi-ficant | .186 | 3.445*<br>1.975*** |
| 2. Job Design | 1.Working Conditions<br>2.Objectivity and Rationality | Signi-ficant | .165 | 3.445*<br>2.427** |
| 3. Performance Management | 1. Compensation<br>2. Communication<br>3. Objectivity and Rationality | Signi-ficant | .366 | 2.278**<br>3.104*<br>2.186** |
| 4. Compensation | 1. Performance Management<br>2. Welfare | Signi-ficant | .314 | 2.278**<br>4.915* |
| 5. Relations | 1. Working Conditions<br>2. Communication<br>3. Objectivity and Rationality | Signi-ficant | .369 | 1.975***<br>2.291**<br>3.596* |
| 6. Communication | 1. Performance Management<br>2.Relations<br>3.Objectivity and Rationality | Signi-ficant | .529 | 3.104*<br>2.291**<br>5.465* |
| 7. Training & Development | 1. Welfare | Signi-ficant | .249 | 4.332* |
| 8. Objectivity &Rationality | 1. Job Design<br>2. Performance Management<br>3. Relations<br>4. Communications<br>5. Grievance | Signi-ficant | .563 | 2.427**<br>2.186**<br>3.596*<br>5.465*<br>1.777*** |
| 9. Grievance | 1. Objectivity and Rationality | Signi-ficant | .207 | 1.777*** |
| 10. Welfare | 1. Compensation<br>2. Training and Development | Signi-ficant | .351 | 4.915*<br>4.332* |

Significance Levels *: 1% **: 5% ***: 10%

The Organizational Climate Factors, one at a time are regressed with profile factors to understand the relationship. The data pertaining to organizational climate and profile factors of the Educational Institute are regressed. When, Job Design is regressed with other profile variables. The explanatory power of the variables $R^2$ is 7.7 per cent only, Gender was found to negatively influencing the organizational Climate variable. When Working Conditions, Performance Management, Compensation, Relations, Communication, Grievance, Welfare and Objectivity and Rationality were treated as dependent variables separately and regressed with profile variables, in each case none of the profile variables were found to be influencing. The Training & Development as dependent variable is regressed with the independent profile variables. The explanatory power ($R^2$ ) is .030. i.e. 3.00 per cent and only Caste was found to be influencing negatively(Table 10). The first hypothesis is false.

**Table 10. Significance Table of one Organizational Climate Factors on Profile Factors**

| | Gender | Caste |
|---|---|---|
| Job Design | -2.951*<br>$R^2$ .077 | |
| Training and Development | | -1.691***<br>$R^2$ .030 |
| Significance Levels<br>*: 1% **: 5% ***: 10% | | |

The findings of the study give an account of the distributive characteristics of faculty in educational institutes. The gender diversity and age diversity is positive. The major concentration of employees is within 40 years (87.3 per cent) and most of the respondents join teaching profession as stop gap arrangement. The decrease in concentration as age increases happens as majority shift to better opportunities in other sectors. The reason for shifting is lower salary. The male-female distribution is even and traditionally women enter teaching profession. The majority of the faculty are migrants and from other urban areas. The designation wise distribution shows no gender difference and females are even with males in designation hierarchy. The majority of both male and female are concentrated at Lecturer and Assistant Professor level. The employee loyalty is very low and majority (62.7per cent) has less than 5 year service. The gender and specialization selection trends are interesting, the females are more in number in management and science stream whereas men are more in computer science. The selection of specialization and gender shows some relationship.

## 5. Conclusion

The Organizational Climate in the private affiliated Educational institutes at post graduate level is moderate at 3.191 and the major factors with moderate means are Performance Management, Relations, Welfare and Objectivity & Rationality. However, Compensation has a very low mean. The multi-regression model was applied to analyze the intra-factor influence. The Performance Management, Objectivity & Rationality and Relations were found to be the major influencers. The Grievance, Training & Development and Compensation were in the lower order. The second hypothesis is true as all the Organizational Climate factors are intertwined and influencing each other either positively or negatively. The profile factors gender and caste is playing a negative role on Organizational Climate factors. The first hypothesis is untrue as only gender and caste were found to influencing Organization Climate factors Job Design and Training and Development negatively. The Compensation being very low as found in the descriptive data is one of the area of concern which is affecting the climate in private educational institutes. Therefore, the educational institutes have to concentrate on grievance mechanism, training & development and compensation for improving the performance.

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# Role of Marketing Intelligence by Strategic Function in Organizational Performance: Evidence from Pakistan

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**Abstract:** The purpose of this study is multifaceted; firstly, it aims to explore the extent to which marketing intelligence is utilized within corporate sector in Pakistan. Secondly, this paper measures the role of marketing intelligence by strategic function on organizational performance. Research on marketing intelligence has consequently increased and grabbed the attention of researchers and marketers to leverage marketing intelligence resulting in increased organizational performance for the last decade. The study uses exploratory approach, sample of the study consisted of 145 professionals from 30 companies related to different sectors operating in Islamabad and Rawalpindi, Pakistan. Structural Equation Model (SEM) Technique was used to test the hypotheses. The study found a strong positive relationship between marketing intelligence by strategic function and organizational performance. The study also found that majority of corporate sector of Pakistan have incorporated and utilized marketing intelligence system. This piece of writing has thrown light on the significance of marketing intelligence and its usefulness as a marketing strategy which not only contributes in the existing body of knowledge but also has many managerial implications. The study endorsed the importance of marketing intelligence by strategic function to heading on this fast-paced competition. As for marketing managers in order to formulate policies; marketing intelligence by strategic function provides a leapfrogging approach to outer perform in the market place.

**Keywords:** Marketing Intelligence, Competitive Intelligence, Strategic Management, Organizational Performance, Dynamic Markets.

**JEL Classification:** M3; M10

## 1. Introduction

The corporate sector plays a vital role in economic development of any country. Economic development refers to the jolts such as quantitative and qualitative changes in the economy. This includes development in human capital, critical

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infrastructure, environmental sustainability, competitiveness and many more. If we flashback a decade before, corporate sector was enjoying the fruits of entrepreneurial activities as well as invested portfolios. By the time, profits remained buoyant for decades due to monopoly. However, now days we are in a climate where there are a lot of political and economic upheavals and insurgencies especially in developing countries leaving organizations confronting a chaotic environment. All the while, globalization, shifting paradigm of markets across overseas, internationalization, and regrettably, the more fierce economic global recession have lead organizations face a challenging competition in the marketplace.

Not only does the above-discussed scenario affect but there also prevail manifold forces in the industry outside the organization that gruffly influence organizational performance. This includes rivals' position in the marketplace, their tactical and strategic moves, and current and future intentions. Organizations today cannot exist without a clear strategic direction (Lackman *et al.,* 2000). Therefore, understanding competitive intensity is central to shaping organization's profit potential. For this reason, organizations not only need to transform their strategic moves the way to head out these pitfalls but also require a proper channeling of marketing intelligence (MI) by keeping an eye on external environment/competitors about what they are up to and where they stand in the marketplace so as to set strategic directions for businesses. Marketing intelligence provides essential underpinnings for crucial outputs of strategic direction; aimed at increasing internal strength and overall performance of an organization. Marketers acknowledge the need of marketing intelligence for planning organizational marketing strategies in order to gain a competitive advantage over competitors. Numerous studies provide evidence for the importance of marketing intelligence on effective strategic direction (Caudron, 1994; Huster, 2005; Lackman *et al.,* 2000; Wright, 2005).

Numerous such initiatives have already been taken on marketing intelligence and organizational performance. However, this study addresses the construct at strategic levels by analyzing the role of MI by strategic function on Organizational Performance. The following research questions are central to this study:

1. To what extent is marketing intelligence utilized by corporate sectors in Pakistan?
2. What is the role of MI by strategic function on organizational performance?

## 2. Literature Review

This world has now become a global village where information conveyance has not been a hysterical task as earlier. By the time, it's not possible to not being aware with what's happening outside in the world. Seemingly, it's not possible for organizations to conduct business without being responsive to what's being new in the world at a moment's notice. Organizations necessitate their internal systems to be in alliance with the world just outside their frontiers. Thus, a continuous, systematic, marketing oriented and updated intelligence is required to cope up this predicament. A term most importantly used in business parlance is marketing intelligence (MI). Top managers have increasingly exploited MI since the inception and speedily elevated use of internet and social media. Organizations have brought into play the use of such sort of activities in broader context for gathering information about competitors, customers, and their surroundings. Webster (1992) defined MI as a marketing concept, the focal of which is the strategic partnership management and organizational positioning in a competitive market aiming at delivering superior value to customers.

Kotler and Armstrong (1997), MI is termed as a systematic set of sources and procedures that management use to gather everyday information about pertinent developments in the marketplace. Tan and Ahmed (1984) further validated that MI in its totality is viewed as an ongoing and interacting structure of equipment, people, and procedures to gathering, sorting, analyzing, and distributing timely, accurately and pertinent information to be used by marketing decision makers for overall efficiency and efficacy of business operations. Many researchers including Sammon, Kurland, and Spitalnic (1984); Gilad, (1991); Jaworski and Wee, (1993); Ettorre (1995); (Zikmund (1996); Wee (2001); Cobb, (2003); Huster (2005) supported the concept of MI and endorsed that such actions of corporations enable organizations to get actionable and pertinent information regarding competitors about what they are up to so as to staying one step ahead of them by applying it to short and long term strategic planning.

### 2.1. MI by Strategic Function and Organizational Performance

Professor Anne Huff highlighted the need for strategic management research to focus on formats and issues meaningful to practitioners; in her 1999 Presidential Address at the Academy of Management Annual Meeting (Huff, 2000). Extending this idea it is suggested that strategic management or strategic marketing management is at the heart of this replica. Today resource allocation is much different and competition is fierce due to scarce resources. Thus, viewing MI in strategic context is required since decision making with respect to strategic facet

has a direct impact on the bottom line (Lackman *et al.,* 2000). Johnson and Scholes (1993) argued that corporate strategy is typically about matching organization's activities to the environment and its resource capability and above all optimizing current performance. As goals are scattered down into actionable and meaningful objectives, which further divides into tasks such as operational and functional. A basic tenet is drawn that MI influences short and long term planning and adds value to decision making (Lackman *et al.,* 2000).

Prescott and Bhardwaj (1995) emphasized on the effectiveness of MI on planning functions. Lackman *et al.* (2000) argued that MI is one of the most imperative and actionable drivers for both strategy and success in the marketplace. Researches on MI including Sammon *et al.* (1984); Peter (2004); Wright (2005) emphasized on the importance of MI in providing meaningful underpinnings for significant output of strategic management that aims at increasing the long-term strength and well-being of an enterprise relative to its competitors. Furthermore, MI serves quadruplet purposes *i.e.* assesses and tracks competitors, identifies potential opportunities and threats, supports strategic planning, and supports strategic decision making (Caudron, 1994) leaving organizations embracing improved performance and gaining competitive advantage over rivals. Kahaner (1997) further supported MI and sanctioned that those who get involved in MI, adopts a pragmatic approach to their work and hold improved organizational performance. The nexus between MI and organizational performance has been discussed in many studies. The current study investigates these relationships in the context of strategy in corporate sector in Pakistan.

The hypotheses in Table 1 can be developed based on previous theoretical discussion.

**Table 1. Development of Hypotheses**

| **Hypotheses** | **Statements** |
|---|---|
| H1 | MI by strategic function is positively correlated with organizational performance. |
| H2 | Majority of firms utilize marketing intelligence practices in Pakistan. |


**Figure 1. Marketing Intelligence by strategic function and organizational performance**

## 3. Research Methodology

### 3.1. Sample and Sampling

The study is conducted to analyze the influence of MI by strategic function of organizational performance. Moreover, the study aims at finding the extent to which MI is being utilized in corporate sector in Pakistan. This is an exploratory research based on primary data. The primary data is collected from professionals working in different corporate sectors of Pakistan. The sampling population is the employees working in different organizations. A sample of 200 employees and survey questionnaire distribution process was personally administered by the research team. A total of 145 usable survey questionnaires were returned leaving a response rate of 73%. The sampling population consisted of 30 firms operating in different sector in Islamabad and Rawalpindi, Pakistan. The authors used convenience-sampling technique to select respondents. The sample included respondents from genders, diverse backgrounds, and different industries so that results can be generalized. In two phases, the survey was conducted, in first phase the self-explanatory questionnaires were distributed among respondents. In second phase, the questionnaires were collected from respondents after a reasonable time. Moreover, a reminder was also given to respondents to ensure maximum response.

### 3.2. Measurement and Instrument

#### 3.2.1. Dependent Variable

There is one dependent variable in this study. The study analyzes the influence of MI by strategic function on organizational performance so organizational performance is dependent variable in this study. The instrument to measure organizational performance has been adopted from Li *et al.* (2008). The instrument contains 9 items and is measure on 5 point Likert scale (1 for strongly agree and 5 for strongly disagree).

### 3.2.2. Independent Variable

The study analyzes the influence of MI by strategic function on organizational performance so MI by strategic function is independent variable. The instrument to measure MI by strategic function is adopted from Lackman *et al.* (2000). The instrument contains 9 items and is measure on 5 point Likert scale (1 for strongly agree and 5 for strongly disagree). The instrument for analyzing the extent to which MI is being utilized in corporate sector in Pakistan is adopted from (Pellissier and Kruger, 2011). The instrument contains 8 items with little modification and is measure on two point scales (1 for yes and 2 for no).

### 3.3. Data Analysis

The data collected was initially fed into SPSS software and transformation of variables was done to make it usable for AMOS. Structural equation model (SEM) technique was used to analyses data and test hypotheses. The structural equation model is an important technique for identification of variables and development of theoretical model (Montgomery *et al.,* 2001, Hair *et al.,* 2006; Ali *et al*. 2010).

## 4 Results and Discussions

The study is undertaken to analyze the influence of MI by strategic function on organizational performance in corporate sector in Pakistan. The correlations analysis is produced in Table 2. Table 2 shows strong positive correlation between MI by strategic function and organizational performance. The analysis of data is given in Table 3 and SEM is presented in Figure 2. Table 3 shows very encouraging results. The value of P should be less than 0.05 to accept any hypothesis. The value of P for hypothesis H1 is well below than 0.05. H1 refers towards the positive relationship between MI by strategic function and organizational performance, which is confirmed by this analysis. Figure 2 describes positive relationship among variables in SEM form. The model fit is also confirmed by SEM as value of P is well below than 0.05. The results of reliability analysis are also very sound with 0.933 value of Cronbach's Alpha of all 18 items that were used in the scale. The results of this study are quite encouraging and well supported by previous studies as discussed above. Extent of MI utilization in corporate sector in Pakistan is presented in Table 4, which is also very sound. These results are also consistent with consideration view of other variables and with the significance of MI by strategic function on organizational performance.

**Table 2. Correlations**

| | | MI by SF | OP |
|---|---|---|---|
| MI by SF | Pearson Correlation | 1 | - |
| | Sig. (2-tailed) | | - |
| | N | 145 | - |
| OP | Pearson Correlation | .877 | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 145 | 145 |

**Table 3. Regression Weights**

| Hypothesis | | | Estimate | S.E. | C.R. | P | Decision |
|---|---|---|---|---|---|---|---|
| H1 | OP | < --- MI by SF | 0.741 | 0.324 | 21.950 | .000 | Accept |

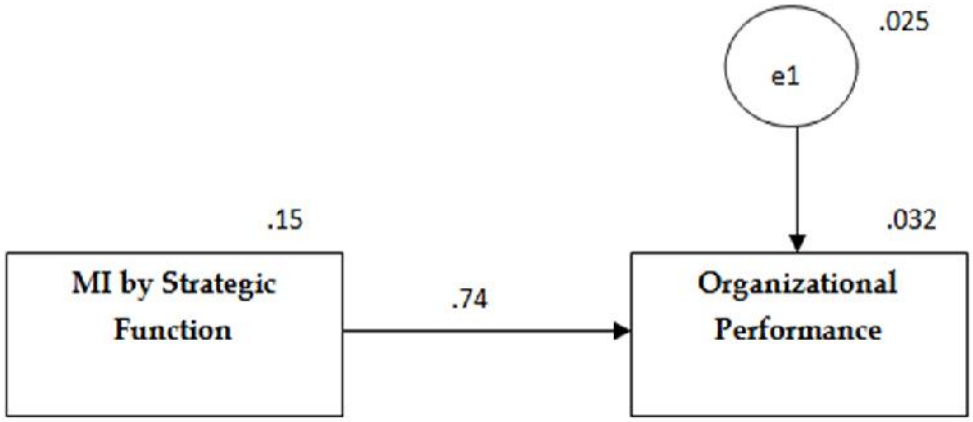


**Figure 2. Structural Equation Model**

**Table 4. Rating MI Utilization**

| Description | %age Rating |
|---|---|
| Our organization is aware of new and pending government legislation | 74 |
| Our organization utilizes external sources of information for market research | 77 |
| Our organization makes use of MI in decision-making | 84 |
| We are up to date with emerging technologies in our field of business | 80 |
| We evaluate the reliability and accuracy of our sources of information | 82 |
| We analyze our competitors and have up to date profiles of them | 84 |
| Our MI is created and distributed to management in a timely fashion | 78 |
| Our organization has a formal MI function | 79 |
| H2 Majority of firms utilize marketing intelligence practices in Pakistan | Supported |

## 5. Conclusion

This study is conducted to analyze the role of MI by strategic function on organizational performance. It is the important study in the context that it provides additional and significant insights to management about the importance of MI by strategic function on organizational performance in corporate sector in Pakistan. The study found strong positive correlation between MI by strategic function and organizational performance. The study also found encouraging results for the use of MI in corporate sector in Pakistan. The study demonstrates that businesses not only can cope up with fast-paced competition but also can stay ahead of their rivals by incorporating and utilizing MI systems both at tactical and strategic levels. Moreover, it also provides useful references for future researchers on this subject matter**.**

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**Microeconomics**

# Generalized Cobb-Douglas Function for Two Inputs and Linear Elasticity

**Catalin Angelo Ioan[1], Gina Ioan[2]**

**Abstract:** The article deals with a production function of two factors with constant scale return where the elasticity of one of the factors is a function of first degree. After the examination of parameters conditions according to the axioms of the production functions, there are computed the main indicators. Also, the combination of factors is determined in order to maximize the total output under a given cost.

**Keywords:** production function; Cobb-Douglas

**JEL Classification:** E23

## 1. General Aspects of the Production Functions

In any economic activity, obtaining a result of it implies, by default, there is a certain number of resources, supposedly indivisible needed for the proper functioning of the production process.

We therefore define on $\mathbf{R}^2$ – the **production space** for two resources: K – capital and L - labor as $SP=\{(K,L) \mid K,L\geq 0\}$ where $x\in SP$, $x=(K,L)$ is an **ordered set of resources**.

Because in a production process, depending on the nature of applied technology, but also its specificity, not any amount of resources is possible, we restrict the production area to a subset $D_p \subset SP$ called **domain of production**.

In a context of the existence of the domain of production, we put the question of determining its output depending on the level of inputs of $D_p$.

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It is called **production function** an application $Q:D_p \to \mathbf{R}_+$, $(K,L) \to Q(K,L) \in \mathbf{R}_+$ $\forall (K,L) \in D_p$.

For an efficient and complex mathematical analysis of a production function, we impose a number of axioms both its definition and its scope.

FP1. The domain of production is convex;

FP2. $Q(0,0)=0$;

FP3. The production function is of class $C^2$ on $D_p$ that is it admits partial derivatives of order 2 and they are continuous;

FP4. The production function is monotonically increasing in each variable;

FP5. The production function is quasiconcave that is: $Q(\lambda x+(1-\lambda)y) \geq \min(Q(x),Q(y))$ $\forall \lambda \in [0,1]$ $\forall x,y \in R_p$.

From a geometric point of view, a quasiconcave function having the property of being above the lowest value recorded at the end of a certain segment. The property is equivalent to the convexity of the set $Q^{-1}[a,\infty)$ $\forall a \in \mathbf{R}$, where $Q^{-1}[a,\infty) = \{x \in R_p \mid Q(x) \geq a\}$.

## 2. The Main Indicators of Production Functions

Consider now a production function: $Q:D_p \to \mathbf{R}_+$, $(K,L) \to Q(K,L) \in \mathbf{R}_+$ $\forall (K,L) \in D_p$.

We call **marginal productivity** relative to an input $x_i$: $\eta_{x_i} = \frac{\partial Q}{\partial x_i}$ and represents the trend of variation of production to the variation of $x_i$.

We call **average productivity** relative to an input $x_i$: $w_{x_i} = \frac{Q}{x_i}$ the value of production at a consumption of a unit of factor $x_i$.

We call **partial marginal substitution rate** of factors i and j the opposite change in the amount of factor j as a substitute for the amount of change in the factor i in the case of a constant level of production and we have: $RMS(i,j) = \frac{\eta_{x_i}}{\eta_{x_j}}$.

We call **elasticity of output** with respect to an input $x_i$: $\varepsilon_{x_i}=\frac{\frac{\partial Q}{\partial x_i}}{\frac{Q}{x_i}}=\frac{\eta_{x_i}}{w_{x_i}}$ and represents the relative variation of production to the relative variation of the factor $x_i$.

Considering now a production function $Q:D_p\to\mathbf{R}_+$ with constant return to scale that is $Q(K,L)=\frac{1}{\lambda}Q(\lambda K,\lambda L)$, let note $\chi=\frac{K}{L}$. It is called the **elasticity of the marginal rate of technical substitution** $\sigma=\frac{\frac{\partial RMS(K,L)}{\partial\chi}}{\frac{RMS(K,L)}{\chi}}$.

### 3. The Generalized Cobb-Douglas Function for Two Inputs

Consider now a production function $Q:D_p\to\mathbf{R}_+$, $(K,L)\to Q(K,L)\in\mathbf{R}_+$ $\forall(K,L)\in D_p$ with constant return to scale, where $\varepsilon_K=\rho(\chi)>0$.

Considering the function q such that: $Q(K,L)=L\,q(\chi)$ we have: $\varepsilon_K=\frac{\eta_K}{w_K}=\frac{\frac{\partial q}{\partial\chi}}{\frac{q}{\chi}}=\frac{\chi q'(\chi)}{q}=\rho(\chi)$.

From here we find that: $\frac{q'(\chi)}{q}=\frac{\rho(\chi)}{\chi}$. Let F be a primitive function of $\frac{\rho(\chi)}{\chi}$. From $\frac{q'(\chi)}{q}=F'(\chi)$ we obtain: $q(\chi)=Ce^{F(\chi)}$ where C - constant strictly positive.

In particular, for $\rho(\chi)=\sum_{k=0}^{m}\beta_k\chi^k$ we have:

$$F(\chi)=\int\frac{\sum_{k=0}^{m}\beta_k\chi^k}{\chi}d\chi=\int\left(\frac{\beta_0}{\chi}+\sum_{k=1}^{m}\beta_k\chi^{k-1}\right)d\chi=\beta_0\ln\chi+\sum_{k=1}^{m}\frac{\beta_k}{k}\chi^k+D$$

and the production function becomes (after an obvious renoting of C):

$$q(\chi)=Ce^{F(\chi)}=C\chi^{\beta_0}e^{\sum_{k=1}^{m}\frac{\beta_k}{k}\chi^k}$$

or other:

$$Q(K,L)=CK^{\beta_0}L^{1-\beta_0}e^{\sum_{k=1}^{m}\frac{\beta_k K^k}{kL^k}}$$

If $\rho(\chi)=\beta_0+\beta_1\chi$ then:

$$Q(K,L)=CK^{\beta_0}L^{1-\beta_0}e^{\frac{\beta_1 K}{L}}$$

## 4. The Generalized Cobb-Douglas Function for Two Inputs and Linear Elasticity

Consider now the production function: $Q(K,L)=CK^aL^{1-a}e^{\frac{bK}{L}}$, K,L>0, a,b,C>0.

Because the function is elementary follows that it is of class $C^\infty$ on the definition domain.

We now have:

$$\frac{\partial Q}{\partial K}=\frac{bK+aL}{KL}Q,\ \frac{\partial Q}{\partial x_2}=-\frac{bK+(a-1)L}{L^2}Q$$

Considering bordered Hessian matrix:

$$H^B(Q)=\begin{pmatrix} 0 & \frac{\partial Q}{\partial K} & \frac{\partial Q}{\partial L} \\ \frac{\partial Q}{\partial K} & \frac{\partial^2 Q}{\partial K^2} & \frac{\partial^2 Q}{\partial K\partial L} \\ \frac{\partial Q}{\partial L} & \frac{\partial^2 Q}{\partial K\partial L} & \frac{\partial^2 Q}{\partial L^2} \end{pmatrix}$$

and the minors:

$$\Delta_1^B=\begin{vmatrix}0 & \frac{\partial Q}{\partial K}\\ \frac{\partial Q}{\partial K} & \frac{\partial^2 Q}{\partial K^2}\end{vmatrix}=-\left(\frac{\partial Q}{\partial K}\right)^2,\ \Delta_2^B=\begin{vmatrix}0 & \frac{\partial Q}{\partial K} & \frac{\partial Q}{\partial L}\\ \frac{\partial Q}{\partial K} & \frac{\partial^2 Q}{\partial K^2} & \frac{\partial^2 Q}{\partial K\partial L}\\ \frac{\partial Q}{\partial L} & \frac{\partial^2 Q}{\partial K\partial L} & \frac{\partial^2 Q}{\partial L^2}\end{vmatrix}=$$

$$2\frac{\partial Q}{\partial L}\frac{\partial Q}{\partial L}\frac{\partial^2 Q}{\partial K\partial L}-\left(\frac{\partial Q}{\partial L}\right)^2\frac{\partial^2 Q}{\partial K^2}-\left(\frac{\partial Q}{\partial K}\right)^2\frac{\partial^2 Q}{\partial L^2}$$

it is known that if $\Delta_1^B<0,\ \Delta_2^B>0$ the function is quasiconcave. Conversely, if the function is quasiconcave then: $\Delta_1^B\le 0,\ \Delta_2^B\ge 0$.

In the present case:

$$\Delta_1^B=-\frac{(bK+aL)^2}{K^2L^2}Q^2,\ \Delta_2^B=-\frac{b^2K^2+2abKL+a(a-1)L^2}{K^2L^4}Q^3$$

It is obvious that $\Delta_1^B<0$. For $\Delta_2^B>0$ it is necessary and sufficient that: $b^2K^2+2abKL+a(a-1)L^2<0\ \ \forall K,L>0$. With the substitution $\chi=\frac{K}{L}$ the statement is equivalent to $b^2\chi^2+2ab\chi+(a^2-a)<0\ \ \forall\chi>0$.

Because the discriminant $\Delta=a^2b^2-b^2(a^2-a)=ab^2$ follows that if $\Delta\le 0$ then $\chi\in\varnothing$. Therefore: $\Delta>0$, $a>0$. We get: $\chi=\frac{K}{L}\in\left(\frac{-a-\sqrt{a}}{b},\frac{-a+\sqrt{a}}{b}\right)\cap(0,\infty)=\left(0,\frac{-a+\sqrt{a}}{b}\right)$. But $\frac{-a+\sqrt{a}}{b}>0$ is equivalent to $a\in(0,1)$.

From the above, for $a\in(0,1)$, $b>0$, the function is quasiconcave on $D_p=\left\{(K,L)\middle|0<K<\frac{-a+\sqrt{a}}{b}L,L>0\right\}\subset\mathbf{R}^2$.

Also, relative to the monotonically increasing in each variable, we have: $\frac{\partial Q}{\partial K}=\frac{bK+aL}{KL}Q>0$ and because: $bK+(a-1)L<b\frac{-a+\sqrt{a}}{b}L+(a-1)L=\left(\sqrt{a}-1\right)L$ <0 we get $\frac{\partial Q}{\partial L}=-\frac{bK+(a-1)L}{L^2}Q>0$.

As an example, for C=1, a=0.2 and b=1 the graph is:

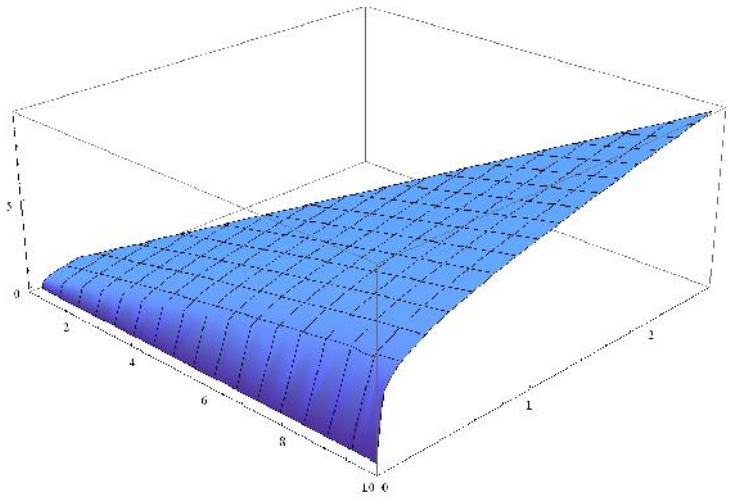

**Figure 1**

## 5 Main Indicators of the Generalized Cobb-Douglas Function for two Inputs and Linear Elasticity

We can compute, after section 2, the main indicators for the production function defined above. We have therefore:

- The marginal productivity:

$$\eta_K=\frac{\partial Q}{\partial K}=\frac{bK+aL}{KL}Q,\ \eta_L=\frac{\partial Q}{\partial L}=-\frac{bK+(a-1)L}{L^2}Q$$

- The average productivity:

$$w_K=\frac{Q}{K},\ w_L=\frac{Q}{L}$$

- The partial marginal substitution rate:

$$RMS(K,L)=-\frac{L(bK+aL)}{K(bK+(a-1)L)},\ RMS(L,K)=-\frac{K(bK+(a-1)L)}{L(bK+aL)}$$

- The elasticity of output:

$$\varepsilon_K=\frac{\frac{\partial Q}{\partial K}}{\frac{Q}{K}}=\frac{\eta_K}{w_K}=\frac{bK+aL}{L},\ \varepsilon_L=\frac{\frac{\partial Q}{\partial L}}{\frac{Q}{L}}=\frac{\eta_L}{w_L}=-\frac{bK+(a-1)L}{L}$$

- The elasticity of the marginal rate of technical substitution:

$$\sigma=\frac{\frac{\partial RMS(K,L)}{\partial \chi}}{\frac{RMS(K,L)}{\chi}}=-1-\frac{b\chi}{(a+b\chi)(a+b\chi-1)}$$

## 6. The Problem of Determining the Maximum of Production in terms of Given Total Cost

Let now the following problem:

$$\begin{cases} \max Q(K,L) \\ p_K K+p_L L=CT>0 \\ K,L\geq 0 \end{cases}$$

where CT is the total cost of the production which is suppose to be a given constant.

From the Karush-Kuhn-Tucker conditions we have the necessary and sufficient conditions (taking into account that the restriction is affine):

$$\begin{cases} \frac{\partial Q}{\partial K}=\frac{\partial Q}{\partial L} \\ \frac{p_K}{p_L} \\ p_K K+p_L L=CT \end{cases}$$

From section 5 we get that the system becomes:

$$\begin{cases} \dfrac{bK+aL}{KL}\Big/\dfrac{p_K}{} = -\dfrac{bK+(a-1)L}{L^2}\Big/\dfrac{}{p_L} \\ p_K K + p_L L = CT \end{cases}$$

or:

$$\begin{cases} bp_K K^2 + ((a-1)p_K + bp_L)KL + ap_L L^2 = 0 \\ p_K K + p_L L = CT \end{cases}$$

In order to K,L exists, we must have from the first equation:

$$\Delta = ((a-1)p_K + bp_L)^2 - 4abp_K p_L = p_L^2\left[(a-1)^2\left(\frac{p_K}{p_L}\right)^2 - 2(a+1)b\left(\frac{p_K}{p_L}\right) + b^2\right] \geq 0$$

Because the discriminant of the paranthesis is: $\Delta' = (a+1)^2 b^2 - (a-1)^2 b^2 = 4ab^2 > 0$ we get:

$$\frac{p_K}{p_L} \in \left(0, \frac{1}{(1+\sqrt{a})^2}b\right] \cup \left[\frac{1}{(1-\sqrt{a})^2}b, \infty\right)$$

Also, from the existence condition of the production function, that is: $0 \leq \frac{K}{L} < \frac{-a+\sqrt{a}}{b}$, the first equation gives that it is always true.

Substituting now from second in the first equation, we get:

$$p_K^2 K^2 - CT((a+1)p_K - bp_L)K + aCT^2 = 0$$

and finally we find:

$$\begin{cases} K = \dfrac{(1+a)p_K - bp_L \pm \sqrt{((1+a)p_K - bp_L)^2 - 4ap_K^2}}{2p_K^2} CT \\ L = \dfrac{(1-a)p_K + bp_L \mp \sqrt{((1+a)p_K - bp_L)^2 - 4ap_K^2}}{2p_K p_L} CT \end{cases}$$

Because $\frac{p_K}{p_L} \in \left(0, \frac{1}{(1+\sqrt{a})^2}b\right] \cup \left[\frac{1}{(1-\sqrt{a})^2}b, \infty\right)$ we have that:

$$\Delta=\left((1+a)p_K-bp_L\right)^2-4ap_K^2=\left(\left(1+\sqrt{a}\right)^2p_K-bp_L\right)\left(\left(1-\sqrt{a}\right)^2p_K-bp_L\right)\geq 0$$

As a conclusion, we have that if $\frac{p_K}{p_L}\in\left(0,\frac{1}{\left(1+\sqrt{a}\right)^2}b\right]\cup\left[\frac{1}{\left(1-\sqrt{a}\right)^2}b,\infty\right)$ the combination of factors which maximize the production when the total cost remaining constant is:

$$\begin{cases} K=\dfrac{(1+a)p_K-bp_L\pm\sqrt{\left((1+a)p_K-bp_L\right)^2-4ap_K^2}}{2p_K^2}CT \\ L=\dfrac{(1-a)p_K+bp_L\mp\sqrt{\left((1+a)p_K-bp_L\right)^2-4ap_K^2}}{2p_Kp_L}CT \end{cases}$$

## 7. Conclusions

The Generalized Cobb-Douglas function for two inputs and linear elasticity is determined from the condition that the linear elasticity of production with capital is linear expressed. The problem of determining the factors of production that maximizes output under a given total cost reveals that it has no choice but in terms of price limitations.

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# A Study of Cobb-Douglas Production Function with Differential Geometry

**Alin Cristian Ioan**[1]

**Abstract:** In this paper we shall made an analysis of Cobb-Douglas production function from the differential point of view. We shall obtain some interesting results about the nature of the points of the surface, the total curvature, the conditions when a production function is minimal and finally we give the equations of the geodesics on the surface i.e. the curves of minimal length between two points.

**Keywords:** production functions; metric; curvature; geodesic; Cobb-Douglas

**JEL Classification:** E23

## 1. Introduction

In the theory of production functions, all computations and phenomenons are studied for a constant level of production. In order to detect many aspects of them, a complete analysis can be made only at the entire surface.

We therefore define on $\mathbf{R}^2$ – the **production space** for two resources: K – capital and L - labor as $SP=\{(K,L) \mid K,L\geq 0\}$ where $x\in SP$, $x=(K,L)$ is an **ordered set of resources**. Because in a production process, depending on the nature of applied technology, but also its specificity, not any amount of resources are possible, we restrict the production area to a subset $D_p \subset SP$ called **domain of production**.

It is called a **Cobb-Douglas production function** an application:

$$Q:D_p\rightarrow \mathbf{R}_+,\ (K,L)\rightarrow Q(K,L)=cK^{\alpha}L^{\beta}\in \mathbf{R}_+\ \forall (K,L)\in D_p,\ \alpha,\beta\in \mathbf{R}^*_+,\ c>0$$

The production function is $C^{\infty}$-differentiable and homogenous of degree $\alpha+\beta$.

## 2. The Differential Geometry of Cobb-Douglas Surface

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The graph representation of a production function is a surface.

Let note in what follows:

$$(1)\ p=\frac{\partial Q}{\partial L},\ q=\frac{\partial Q}{\partial K},\ r=\frac{\partial^2 Q}{\partial L^2},\ s=\frac{\partial^2 Q}{\partial L\partial K},\ t=\frac{\partial^2 Q}{\partial K^2}$$

We have after simple calculations:

$$(2)\ p=\frac{\beta Q}{L},\ q=\frac{\alpha Q}{K},\ r=\frac{\beta(\beta-1)Q}{L^2},\ s=\frac{\alpha\beta Q}{KL},\ t=\frac{\alpha(\alpha-1)Q}{K^2}$$

The bordered Hessian:

$$(3)\ H_f=\begin{pmatrix}0 & q & p\\ q & t & s\\ p & s & r\end{pmatrix}=\begin{pmatrix}0 & \frac{\alpha Q}{K} & \frac{\beta Q}{L}\\ \frac{\alpha Q}{K} & \frac{\alpha(\alpha-1)Q}{K^2} & \frac{\alpha\beta Q}{KL}\\ \frac{\beta Q}{L} & \frac{\alpha\beta Q}{KL} & \frac{\beta(\beta-1)Q}{L^2}\end{pmatrix}$$

therefore, because:

$$(4)\ \Delta^B{}_1=\begin{vmatrix}0 & \frac{\alpha Q}{K}\\ \frac{\alpha Q}{K} & \frac{\alpha(\alpha-1)Q}{K^2}\end{vmatrix}=-\frac{\alpha^2Q^2}{K^2}<0,\qquad \Delta^B{}_2=\begin{vmatrix}0 & \frac{\alpha Q}{K} & \frac{\beta Q}{L}\\ \frac{\alpha Q}{K} & \frac{\alpha(\alpha-1)Q}{K^2} & \frac{\alpha\beta Q}{KL}\\ \frac{\beta Q}{L} & \frac{\alpha\beta Q}{KL} & \frac{\beta(\beta-1)Q}{L^2}\end{vmatrix}=$$

$$\frac{\alpha\beta(\alpha+\beta)Q^3}{K^2L^2}>0$$

we obtain that Q is quasiconcave, that is for any $a\in\mathbf{R}$, $Q^{-1}([a,\infty))$ is convex in $\mathbf{R}^2$.

For a constant value of one parameter we obtain a curve on the surface, that is $Q=Q(K,L_0)$ or $Q=Q(K_0,L)$ are both curves on the production surface. They are obtained from the intersection of the plane $L=L_0$ or $K=K_0$ with the surface $Q=Q(K,L)$.

In the study of the surfaces, two quadratic forms are very useful.

The first fundamental quadratic form of the surface is:

$$(5)\ g=g_{11}dL^2+2g_{12}dLdK+g_{22}dK^2$$

where: $g_{11}=1+p^2$, $g_{12}=pq$, $g_{22}=1+q^2$.

In our case:

(6) $g_{11}=1+\beta^2c^2K^{2\alpha}L^{2\beta-2}$ , $g_{12}=\alpha\beta c^2K^{2\alpha-1}L^{2\beta-1}$ , $g_{22}=1+\alpha^2c^2K^{2\alpha-2}L^{2\beta}$

The area element is:

(7) $d\sigma=\sqrt{g_{11}g_{22}-g_{12}^2}\ dKdL=\sqrt{\Delta}\ dKdL=\sqrt{1+\alpha^2c^2K^{2\alpha-2}L^{2\beta}+\beta^2c^2K^{2\alpha}L^{2\beta-2}}dKdL$

and the surface area A when $(K,L)\in R$ (a region in the plane K-O-L) is

$A=\iint_R d\sigma dKdL$ .

The second fundamental form of the surface is:

(8) $h=h_{11}dL^2+2\ h_{12}dLdK+\ h_{22}dK^2$

where: $h_{11}=\frac{r}{\sqrt{1+p^2+q^2}}$ , $h_{12}=\frac{s}{\sqrt{1+p^2+q^2}}$ , $h_{22}=\frac{t}{\sqrt{1+p^2+q^2}}$ .

In our case:

(9) $h_{11}=\frac{\beta(\beta-1)cK^{\alpha}L^{\beta-2}}{\sqrt{1+\alpha^2c^2K^{2\alpha-2}L^{2\beta}+\beta^2c^2K^{2\alpha}L^{2\beta-2}}}$ ,

$h_{12}=\frac{\alpha\beta cK^{\alpha-1}L^{\beta-1}}{\sqrt{1+\alpha^2c^2K^{2\alpha-2}L^{2\beta}+\beta^2c^2K^{2\alpha}L^{2\beta-2}}}$ ,

$h_{22}=\frac{\alpha(\alpha-1)cK^{\alpha-2}L^{\beta}}{\sqrt{1+\alpha^2c^2K^{2\alpha-2}L^{2\beta}+\beta^2c^2K^{2\alpha}L^{2\beta-2}}}$

Considering the quantity $\delta=h_{11}h_{22}-h_{12}^2$ we have that:

(10) $\delta=-\frac{\alpha\beta(\alpha+\beta-1)c^2K^{2\alpha-2}L^{2\beta-2}}{1+\alpha^2c^2K^{2\alpha-2}L^{2\beta}+\beta^2c^2K^{2\alpha}L^{2\beta-2}}$

- If $\delta>0$ in each point of the surface, we will say that it is elliptical. Such surfaces are the hyperboloid with two sheets, the elliptical paraboloid and the ellipsoid.
- If $\delta<0$ in each point of the surface, we will say that it is hyperbolic. Such surfaces are the hyperboloid with one sheet and the hyperbolic paraboloid.
- If $\delta=0$ in each point of the surface, we will say that it is parabolic. Such surfaces are the cone surfaces and the cylinder surfaces.

From (10) we find that:

- $\alpha+\beta<1$: the production surface is elliptical;
- $\alpha+\beta=1$: the production surface is parabolic;
- $\alpha+\beta>1$: the production surface is hyperbolic

The curvature of a curve is, from an elementary point of view, the degree of deviation of the curve relative to a straight line. Considering a surface S and an arbitrary curve through a point P of the surface who has the tangent vector v in P, let the plane $\pi$ determined by the vector v and the normal N in P at S. The intersection of $\pi$ with S is a curve $C_n$ named normal section of S. Its curvature is called normal curvature.

If we have a direction $m=\frac{dL}{dK}$ in the tangent plane of the surface in an arbitrary point P we have that the normal curvature is given by:

(11) $$k(m)=\frac{h_{11}m^2+2h_{12}m+h_{22}}{g_{11}m^2+2g_{12}m+g_{22}}$$

The extreme values $k_1$ and $k_2$ of the function k(m) are called the principal curvatures of the surface in that point. They satisfy also the equation:

(12) $$(g_{11}g_{22}-g_{12}^2)k^2-(g_{11}h_{22}-2g_{12}h_{12}+g_{22}h_{11})k+(h_{11}h_{22}-h_{12}^2)=0$$

The values of m, who give the extremes, call principal directions in that point.

They also satisfy the equation:

(13) $$(g_{11}s-g_{12}r)m^2+(g_{11}t-g_{22}r)m+(g_{12}t-g_{22}s)=0$$

The curve $\frac{dL}{dK}=m$ (where m is one of the principal directions) is called line of curvature on the surface. On such a curve we have the maximum or minimum variation of the value of Q in a neighborhood of P.

The quantity $K=k_1k_2$ is named the total curvature in the considered point and $H=\frac{k_1+k_2}{2}$ is named the mean curvature of the surface in that point.

We have therefore:

(14) $$K=\frac{h_{11}h_{22}-h_{12}^2}{g_{11}g_{22}-g_{12}^2}=\frac{\delta}{\Delta}=-\frac{\alpha\beta(\alpha+\beta-1)c^2K^{2\alpha-2}L^{2\beta-2}}{\left(1+\alpha^2c^2K^{2\alpha-2}L^{2\beta}+\beta^2c^2K^{2\alpha}L^{2\beta-2}\right)^2}$$

$$(15)\qquad H=\frac{g_{11}h_{22}-2g_{12}h_{12}+g_{22}h_{11}}{g_{11}g_{22}-g_{12}^2}=$$
$$-\frac{cK^{\alpha-2}L^{\beta-2}\left(\alpha(1-\alpha)L^2+\beta(1-\beta)K^2+\alpha\beta(\alpha+\beta)c^2K^{2\alpha}L^{2\beta}\right)}{\left(1+\alpha^2c^2K^{2\alpha-2}L^{2\beta}+\beta^2c^2K^{2\alpha}L^{2\beta-2}\right)^{\frac{3}{2}}}$$

A surface with K=constant call surface with constant total curvature and if H=0 call minimal surface. In our case we can see that K=0 if and only if: $\alpha+\beta=1$.

If we consider now in the tangent plane $\pi$ at the surface in a point P a direction m, if $h_{11}m^2+2\ h_{12}m+h_{22}=0$ we will say that m is an asymptotic direction, and the equation: $h_{11}\left(\frac{dL}{dK}\right)^2+2h_{12}\frac{dL}{dK}+h_{22}=0$ gives the asymptotic curves of the surface in the point P.

In our case, the asymptotic directions are:

$$(16)\qquad m_1=\frac{\alpha\beta+\sqrt{\alpha\beta(\alpha+\beta-1)}}{\beta(1-\beta)}\frac{L}{K},\ m_2=\frac{\alpha\beta-\sqrt{\alpha\beta(\alpha+\beta-1)}}{\beta(1-\beta)}\frac{L}{K}$$

If $\alpha+\beta=1$ then both asymptotic directions are equal.

With notations $x^1=L$, $x^2=K$, let define now the Christoffel symbols of first order:

$$(17)\qquad |ij,k|=\frac{1}{2}\left(\frac{\partial g_{jk}}{\partial x^i}+\frac{\partial g_{ik}}{\partial x^j}-\frac{\partial g_{ij}}{\partial x^k}\right)$$

and of second order:

$$(18)\qquad \left|\begin{matrix}i\\jk\end{matrix}\right|=g^{i1}|jk,1|+g^{i2}|jk,2|$$

where $g^{11}=\frac{1}{\Delta}G$, $g^{12}=-\frac{1}{\Delta}F$, $g^{22}=\frac{1}{\Delta}E$ are the components of the inverse matrix of $\begin{pmatrix}g_{11} & g_{12}\\ g_{12} & g_{22}\end{pmatrix}$.

We have now:

$$(19)\qquad |11,1|=\frac{1}{2}\frac{\partial g_{11}}{\partial L},\ |11,2|=\frac{\partial g_{12}}{\partial L}-\frac{1}{2}\frac{\partial g_{11}}{\partial K},\ |12,1|=\frac{1}{2}\frac{\partial g_{11}}{\partial K},\ |12,2|=\frac{1}{2}\frac{\partial g_{22}}{\partial L},$$

$$|22,1| = \frac{\partial g_{12}}{\partial K} - \frac{1}{2}\frac{\partial g_{22}}{\partial L},\ |22,2| = \frac{1}{2}\frac{\partial g_{22}}{\partial K}$$

$$(20)\qquad \left|\begin{matrix}1\\11\end{matrix}\right| = g^{11}|11,1| + g^{12}|11,2| = \frac{1}{\Delta}\left[\frac{1}{2}g_{22}\frac{\partial g_{11}}{\partial L} - g_{12}\left(\frac{\partial g_{12}}{\partial L} - \frac{1}{2}\frac{\partial g_{11}}{\partial K}\right)\right],$$

$$\left|\begin{matrix}2\\11\end{matrix}\right| = g^{21}|11,1| + g^{22}|11,2| = \frac{1}{\Delta}\left[-\frac{1}{2}g_{12}\frac{\partial g_{11}}{\partial L} + g_{11}\left(\frac{\partial g_{12}}{\partial L} - \frac{1}{2}\frac{\partial g_{11}}{\partial K}\right)\right],$$

$$\left|\begin{matrix}1\\12\end{matrix}\right| = g^{11}|12,1| + g^{12}|12,2| = \frac{1}{\Delta}\left[\frac{1}{2}g_{22}\frac{\partial g_{11}}{\partial K} - \frac{1}{2}g_{12}\frac{\partial g_{22}}{\partial L}\right],$$

$$\left|\begin{matrix}2\\12\end{matrix}\right| = g^{21}|12,1| + g^{22}|12,2| = \frac{1}{\Delta}\left[-\frac{1}{2}g_{12}\frac{\partial g_{11}}{\partial K} + \frac{1}{2}g_{11}\frac{\partial g_{22}}{\partial L}\right],$$

$$\left|\begin{matrix}1\\22\end{matrix}\right| = g^{11}|22,1| + g^{12}|22,2| = \frac{1}{\Delta}\left[g_{22}\left(\frac{\partial g_{12}}{\partial K} - \frac{1}{2}\frac{\partial g_{22}}{\partial L}\right) - g_{12}\frac{1}{2}\frac{\partial g_{22}}{\partial K}\right],$$

$$\left|\begin{matrix}2\\22\end{matrix}\right| = g^{21}|22,1| + g^{22}|22,2| = \frac{1}{\Delta}\left[-g_{12}\left(\frac{\partial g_{12}}{\partial K} - \frac{1}{2}\frac{\partial g_{22}}{\partial L}\right) + \frac{1}{2}g_{11}\frac{\partial g_{22}}{\partial K}\right]$$

From the upper we find that:

$$(21)\qquad |11,1| = (\beta-1)\beta^2 c^2 K^{2\alpha} L^{-3+2\beta},\ |11,2| = \alpha(\beta-1)\beta c^2 K^{-1+2\alpha} L^{-2+2\beta},$$

$$|12,1| = \alpha\beta^2 c^2 K^{-1+2\alpha} L^{-2+2\beta},\ |12,2| = \alpha^2\beta c^2 K^{-2+2\alpha} L^{-1+2\beta},$$

$$|22,1| = \alpha(\alpha-1)\beta c^2 K^{-2+2\alpha} L^{-1+2\beta},\ |22,2| = \alpha^2(\alpha-1)c^2 K^{-3+2\alpha} L^{2\beta}$$

$$(22)\qquad \left|\begin{matrix}1\\11\end{matrix}\right| = \frac{(\beta-1)\beta^2 c^2 K^{2+2\alpha}}{\beta^2 c^2 K^{2+2\alpha} L + L^3\left(\alpha^2 c^2 K^{2\alpha} + K^2 L^{-2\beta}\right)},$$

$$\left|\begin{matrix}2\\11\end{matrix}\right| = \frac{\alpha(\beta-1)\beta c^2 K^{1+2\alpha} L^{2\beta}}{\beta^2 c^2 K^{2+2\alpha} L^{2\beta} + \alpha^2 c^2 K^{2\alpha} L^{2+2\beta} + K^2 L^2},$$

$$\left|\begin{matrix}1\\12\end{matrix}\right| = \frac{\alpha\beta^2 c^2 K^{1+2\alpha} L^{2\beta}}{\beta^2 c^2 K^{2+2\alpha} L^{2\beta} + \alpha^2 c^2 K^{2\alpha} L^{2+2\beta} + K^2 L^2},$$

$$\left|\begin{matrix}2\\12\end{matrix}\right|=\frac{\alpha^2\beta c^2K^{2\alpha}L^{1+2\beta}}{\beta^2c^2K^{2+2\alpha}L^{2\beta}+\alpha^2c^2K^{2\alpha}L^{2+2\beta}+K^2L^2},$$

$$\left|\begin{matrix}1\\22\end{matrix}\right|=\frac{\alpha(\alpha-1)\beta c^2K^{2\alpha}L^{1+2\beta}}{\beta^2c^2K^{2+2\alpha}L^{2\beta}+\alpha^2c^2K^{2\alpha}L^{2+2\beta}+K^2L^2},$$

$$\left|\begin{matrix}2\\22\end{matrix}\right|=\frac{\alpha^2(\alpha-1)c^2L^{2+2\beta}}{K^{3-2\alpha}L^2+\beta^2c^2K^3L^{2\beta}+\alpha^2c^2KL^{2+2\beta}}$$

A geodesic is in common language the shortest curve between two points. It is useful when we try to determine the shortest way to go from a production at other in a minimum time. The equation of a geodesic is:

$$\frac{d^2x^i}{ds^2}+\left|\begin{matrix}i\\jk\end{matrix}\right|\frac{dx^j}{ds}\frac{dx^k}{ds}=0 \tag{23}$$

that is:

$$\frac{d^2L}{ds^2}+\left|\begin{matrix}1\\11\end{matrix}\right|\left(\frac{dL}{ds}\right)^2+2\left|\begin{matrix}1\\12\end{matrix}\right|\frac{dL}{ds}\frac{dK}{ds}+\left|\begin{matrix}1\\22\end{matrix}\right|\left(\frac{dK}{ds}\right)^2=0 \tag{24}$$

$$\frac{d^2K}{ds^2}+\left|\begin{matrix}2\\11\end{matrix}\right|\left(\frac{dL}{ds}\right)^2+2\left|\begin{matrix}2\\12\end{matrix}\right|\frac{dL}{ds}\frac{dK}{ds}+\left|\begin{matrix}2\\22\end{matrix}\right|\left(\frac{dK}{ds}\right)^2=0 \tag{25}$$

or, with the quantities determined:

(24)

$$\frac{d^2L}{ds^2}+\frac{(\beta-1)\beta^2c^2K^{2+2\alpha}}{\beta^2c^2K^{2+2\alpha}L+L^3(\alpha^2c^2K^{2\alpha}+K^2L^{-2\beta})}\left(\frac{dL}{ds}\right)^2+$$

$$2\frac{\alpha\beta^2c^2K^{1+2\alpha}L^{2\beta}}{\beta^2c^2K^{2+2\alpha}L^{2\beta}+\alpha^2c^2K^{2\alpha}L^{2+2\beta}+K^2L^2}\frac{dL}{ds}\frac{dK}{ds}+\frac{\alpha(\alpha-1)\beta c^2K^{2\alpha}L^{1+2\beta}}{\beta^2c^2K^{2+2\alpha}L^{2\beta}+\alpha^2c^2K^{2\alpha}L^{2+2\beta}+K^2L^2}\left(\frac{dK}{ds}\right)^2=0$$

(25)

$$\frac{d^2K}{ds^2}+\frac{\alpha(\beta-1)\beta c^2K^{1+2\alpha}L^{2\beta}}{\beta^2c^2K^{2+2\alpha}L^{2\beta}+\alpha^2c^2K^{2\alpha}L^{2+2\beta}+K^2L^2}\left(\frac{dL}{ds}\right)^2+$$

$$2\frac{\alpha^2\beta c^2K^{2\alpha}L^{1+2\beta}}{\beta^2c^2K^{2+2\alpha}L^{2\beta}+\alpha^2c^2K^{2\alpha}L^{2+2\beta}+K^2L^2}\frac{dL}{ds}\frac{dK}{ds}+\frac{\alpha^2(\alpha-1)c^2L^{2+2\beta}}{K^{3-2\alpha}L^2+\beta^2c^2K^3L^{2\beta}+\alpha^2c^2KL^{2+2\beta}}\left(\frac{dK}{ds}\right)^2=0$$

The equations of geodesics are: L=L(s), K=K(s) where s is the element of arc on the curves.

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## Financial, Public and Regional Economics

# The Economic Component of National Security – Current Issues

**Maria Constantinescu**[1]

**Abstract:** The main purpose of this paper is to underline the main current approaches regarding the economic component of national security, with conclusions focused on the globalization effects on the national economies and the national security of the states. The dynamics of the unfolding political and economic events determines the need for the analysis – further developed in the paper - of the relevant variables and of the way these are involved in the intricate equations describing the current political, economic and social environment. One of the main results of the analysis is that national security represents a goal for any country wishing to provide sustainable welfare for its citizens, and this sustainable welfare cannot be achieved without sustainable economic security and development.

**Keywords:** economy; trade; imbalances; national security; resources; energy security

**JEL Classification:** F52; F13

## 1. Introduction

The concept of national security has traditionally been synonymous to that of military security, referring to the defense of a country against an external military threat. In the second half of the 20th century, a rapidly evolving international security environment has given rise to new threats and risks, leading to the need to extend the concept of national security to cover these new challenges. Thus, national security now covers not only military security, but the areas of economic security, state and public security, food security, cyber defense, human security, environmental security etc. Within these areas of security, the importance of economic security has increased, especially in the years following the economic crisis of 2008, which affected manifested itself at global scale and whose aftermaths are still a challenge to overcome by many countries of the world.
The objective of this paper is to provide an overview of the main ways national

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security and economic issues are interconnected. The scope of this paper is by no means exhaustive, as it focuses on just a few of the multitude of factors, correlations and relations between economic issues, social issues and national security issues, following the research directions mentioned below:

- the concept of economic security;
- trade and payment imbalances as issues for national security;
- the challenge of natural resources availability and control.

## 2. Economic Security Components in the Current Global Environment

The concept of economic security is not a new one, as it has been present, in an incipient form, since the creation of the GATT (the General Agreement on Tariffs and Trade). Although GATT has encouraged its member states to reduce some tariffs and trade barriers, in order to promote freer trade on a mutually advantageous basis, some critics have viewed the Agreement as a threat to the economic well-being of the countries, by exposing the domestic producers to unfair competition. As a result, some countries have taken steps to limit the expansion of free trade in situations when they considered that their national security was under threat.

An illustrative example refers to the US Trade Expansion Act of 1962, which stipulates in section 232 "prohibition on decrease or elimination of duties or other import restrictions if such reduction or elimination would threaten to impair national security". The most obvious area of industry that falls under this type of reasoning is the domestic defense industry, in the broad sense, with many of the developed countries taking steps towards protecting the domestic manufacturers of goods destined for natinal defense (ranging from weapons to electronic components and even footware). For instance, France stipulates in its Law of Military Programming 2003-2008 (The French military planning law 2003/2008) that it must „develop the resources of protection against new threats and to preserve an industrial base ..to manufacture major defense systems".

In the same line of thinking, Russia, in its National Security Strategy, considers as one of the main sources of problems for its national security „the adoption of discriminatory measures the intensification of unfair competition with regards to Russia, and likewise due to crisis phenomena in the global financial-banking system".

Other approaches view threats to national security in a broader sense, covering also the impact that competition from foreign companies may have on the national economy functioning and development. In this sense, the implications of foriegn competition on the national industries, and also „any substantial unemployment,

decrease in revenues of government, loss of skills or investment, or other serious effects resulting from the displacement of any domestic products by excessive imports" (US Trade Expansion Act of 1962, section 232) are considered factors that have to be analyzed and countered in the effort to ensure the economic component of the national security.

In the Polish National Security Strategy, economic growth is considered a key component of national security, along with the development of the domestic defense industry, the provision of energy security and the trade of strategic goods and services.

In this respect, the Global Risks Report 2014 has identified, from a list of 31 risks, the fiscal crises in key economies and structurally high unemployment /underemployment as the first (respectively the second) highest risks facing the world in 2014. Other economic risks identified by the Report, though not as pressing, are still a major source of concern in regard to security: failure of a major financial mechanism or institution, liquidity crises, oil-price shock to the global economy, failure/shortfall of critical infrastructure, decline of importance of the US dollar as a major currency. Several of these risks already became a reality in the past and history has shown the high vulnerability of economies to such events as an oil price shock (or a sharp decrease in supply), or liquidity crises.

Even though the Report mentioned only the decline of the importance of the US dollar, the decline of other major currencies would be equally threatening to the nation's security. Following the economic crisis and the ensuing sovereign debt crisis in Europe, there was a real risk of euro failure, with some EU members giving up the currency, with difficult to quantify negative consequences on the entire continent, ranging from weakened national currencies, failure of bank systems and other financial institutions, rise in unemployment, rise in prices, to government default and deepened recession in Europe, US and even other areas of the world.

### 2.1. Trade and Payments Imbalances

As in the globalized environment, no country stand completely on its own, invulnerable to the problems of other economies, one of the most significant economic risk situations (due to its size and potential implications on the national security of many countries), relates to the trade and payments deficits. Traditionally, these deficits are run by developing countries, which import a lot of manufactured goods and export raw materials, but a curent and serious matter of concern in this issue refers to the trade imbalances between the developed

economies (especially United States, European Union, Japan, South Korea) and China.

As China's fast development in the recent decade has been strongly supported by exports (with a contribution to GDP ranging from 14% of GDP in 1993 to 27% in 2012 and 26% in 2013, according to the statistics provided by the World Bank), conquering export markets became a priority, and many countries became markets for Chinese imported goods. Fueled by low prices (achieved through low labor prices, but also the manipulation of the Chinese currency), Chinese exports can be found all over the world, with main destinations in 2012 United States (17.2% of China's exports), European Union-27 (16,3%), Japan (7.4%) and the Republic of Korea (4,3%), according to the World Trade Organization statistics.


**Figure 1. The evolution of China's exports, 1990-2013**

*Source: OECD statistics, http://stats.oecd.org/index.aspx?queryid=167#*

The figure above clearly presents the remarkable and consistent increase in China's exports over the last two decades, from 83.95 billion USD in 1992 up to a staggering 2214.77 billion USD in 2013, according to the OECD statistics, providing a visual reference of how, gradually, China started to dominate the world trade.

Following the recent economic crisis, free trade, advocated as one of the ways to economic development in the world, has proven also its limitations, as many world economies have been affected not only by the trade imbalances, but also by their

effects on their national economies. An illustrative example is that of the relations between the US and China. As Chinese manufactured goods got access on the American markets, US companies, in search of higher profits, also benefited from the access to the Chinese markets, with tax breaks, subsidies and the cheap labor. Many US multinational companies moved their production facilities in China, while China benefited from their know how and modern technologies. According to some authors (Xing, 2010), China was the biggest recipient of foreign direct investments of all the developing countries and the third recipient in the world of FDI, in the last 30 years.

As a result, China's companies begun to produce high amount of cheap, manufactured goods (including technological advanced product), flooding the US markets. The result for the US was first of all a a serious trade imbalance: for the 17.2 % of China's exports to US, the US exports to China are of only 7.4% of the Chinese imports. In real terms, this meant an increase of the US imports from China from 15,237.4 million USD in 1990 to 293,863.1 million USD in 2014, equivalent to an impressive increase of 1828,6% (in accodance with the data provided by the United States Census Burreau).

Another visible result was in the form of domestic problems, related to rising unemployment and falling wages in the industries directly threatened by the Chinese competition. The competition from Chinese imports had as result a diminished manufacturing employment in the local labor market, but also a decline in wages manifested beyond the manufacturing sector, leading to a significand reduction in the average household incomes, and also to an increase in transfer payments for federal disability, in-kind medical transfer payments, unemployment insurance and income assistance programs (Autor, Dorn and Hanson, 2011). Based on the analysis by the Economic Policy Institute analyzing costs of China's growing trade deficit, the implications of the US trade deficit with China meant more than 2.7 million jobs losses between 2001 and 2011. Unemployment, lack of consumer faith in the economic perspectives, falling incomes are ingredients to rising social problems (increase in crime rate, alchool and drugs abuse, increased popularity for radical movements etc), with potential negative implications on the national security.

### 2.2. Resources Availability and Control

During the entire history of mankind, countless conflicts have been fought over the control and availabilty of natural resources, and this trend is still present in the modern world, as an intricate interaction exists between national security, potential tensions and even conflicts and the natural environment and resources.

Natural resources are often the hidden cause of conflicts and tensions, due to their increased scarcity or unavailability, but also to the need to control sufficient resources used to finance armed forces or sustain economies.

Particularly in the case of the developing countries, one of the main risks to the national security comes from the use of an economic development model based on the export of raw materials. The narrower the range of products exported and the bigger their share of contribution to the GDP, the higher the risks for national security. Countries relying on a narrow range of raw materials (such as cocoa, coffee, timber, diamonds, iron ore etc) can be seriously affected if the prices of these commodities go down, trigering political instability, economic downturn, unemployment and other nagative economic effects, which in turn may lead to social unrest, violence and tensions.

The desire to control natural resources has been known, over time, to directly cause armed conflict. From the colonial conflicts of the 19th century, to the present day conflicts in many developing countries, natural resources have always been a source of tension, sometimes considered a form of „natural resources curse". Factors present in many developping countries, especially in Africa, such as weak governments, poor economic and living conditions, high unemployment, ethnic diversity, combined with rich natural resources, have often led to conflicts over who controls these resources, leading to civil war or even conflicts between states.For example, the conflict in Sudan that raged between 1983 and 2005 was largely fueled by oil, the events in Sierra Leone from 1991 to 2000 by the intention of the warring factions to control resources of diamonds, cocoa and coffee, and the seemingly never ending series of conflicts in Democratic Republic of Congo, between 1996-1998, 1998-2003, 2003-2008 has been fueled by the desire to control the extraction and trade of copper, coltan, diamonds, gold, cobalt, timber and tin.

Another result was the involvement of many unscrupulous foreign companies in the extraction and trade of such resources (timber, oil, precious gems, minerals such as coltane etc), with sometimes dubious business practices and profits and returns which provided low benefits for the local economies, as they were mostly repatriated to the country of origin.

### 2.3. Energy Security

One of the most important resources that makes the subject of national secuity concerns refers to securing the access to energy sources (mainly oil and natural gas), vital for the functioning of an economy. As a result, the issue is featured even in various free trade agreements, as an exception. For example, within NAFTA,

member countries may invoke article 607 (National Security measures), of Chapter 6 Energy and Basic Petrochemicals, in order to „adopt or maintain a measure restricting imports of an energy or basic petrochemical good from, or exports of an energy or basic petrochemical good to, another Party ... to the extent necessary to: a) supply a military establishment of a Party or enable fulfillment of a critical defense contract of a Party; b) respond to a situation of armed conflict involving the Party taking the measure" (North American Free Trade Agreement, chapter 6, article 607).

The need to provide energy security may manifest itself through the protection of the energy supply from foreign attack, providing protection of critical infrastructure, reducing dependency on energy imports, but also through the attempt to secure the necessary energy at reasonable prices. In this context, reasonable prices means the appropriate level of prices necessary to avoid negative effects on the national economy, such as reduced productivity, increased inflation, diminished consumption, increased production costs, etc. Reducing depenency on energy imports, especially in relation to solid fuels, crude oil and natural gas, is one of the most important issues faced by many developed and developing economies, as it is a source of large costs to the economy and a source of national security challenges. As the figure below illustrates, EU (at 28 members) is a good example of such dependence and vulnerability, with imports from Russia in 2012 at a level of 25.9% for solid fuels, 33.7% for crude oil and 32% for natural gas (according to Eurostat statistics, online data codes nrg_121a, nrg_122a, nrg_123a, nrg_124a).

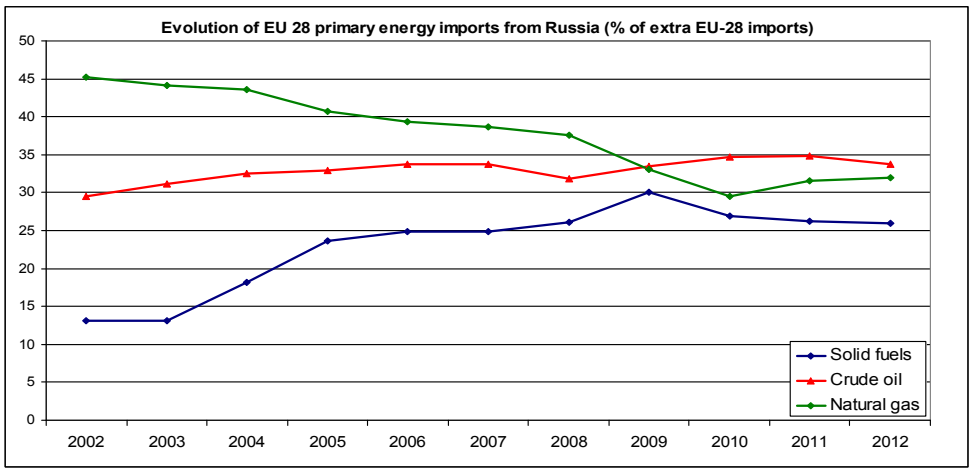


**Figure 2. The evolution of EU's primary energy imports from Russia, (% of extra EU-28 imports)**

*Source: Eurostat, online data codes nrg_121a, nrg_122a, nrg_123a, nrg_124a*

The figure also illustrates the attempt of the EU to reduce its dependence on imports from Russia in regard to natural gas (with Norway among the most important alternative sources), but at the same time its increased dependence on imports of solid fuels and crude oil.

One of the first implications of energy dependency is the adverse effects the increase in prices shall have on the trade balance of the importing country, directly proportional to the share of imports in total energy consumption.

A second implication derives from the particular increase in oil prices, as they are closely linked to the transport costs, which in turn influences (in the sense of increase) the prices of almost all the goods and services in an economy. Even though each country's economy may respond differently to an increase in fuel prices, depending on specific factors, generally speaking this situation may lead to decreased consumption, higher inflation and cause a slowdown of the entire economy.

In the figure below, the evolution of the EU gas prices features the increasing trend of this type of energy, with the exception of the period following the onset of the economic crisis, which generated a significant drop in demand and a decrease in the prices.

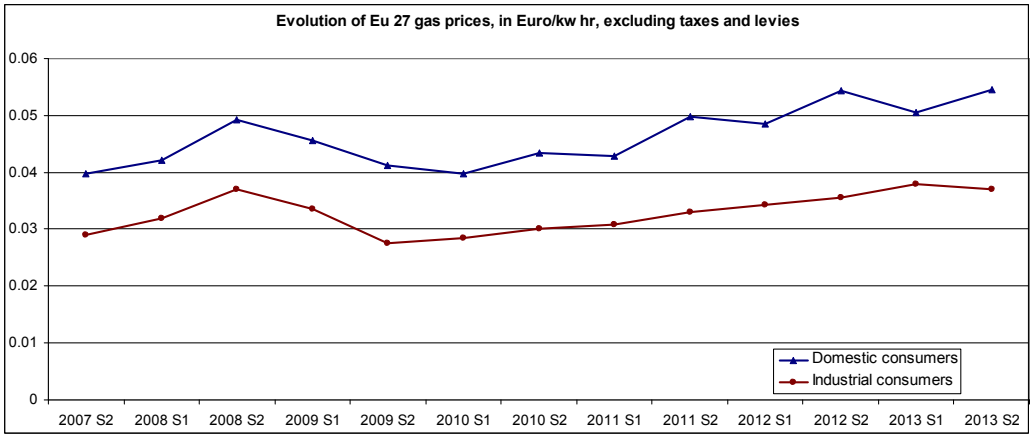


**Figure 3. The evolution of EU's gas prices**

*Source: Eurostat, online data codes nrg_pc_202, nrg_pc_203*

The long term depletion of energy resources ar global level, coupled with an unsustainable (on long term) consumption-based economic development model used by many developed countries, with potential serious environmental consequences, shall promote energy security as one of the most important challenges for national security in the 21st century

## 3. Conclusion

In the aftermath of the greatest economic crisis faced by the world in the last half a century, the world economy has still yet to recover. Among the many problems preventing this recovery, one may mention the fall in the aggregate demand, fuelled by the financial crisis and the recession, which generated high unemployment and falling incomes and defaulting debt. Many of the world's developed and developing economies are still struggling with public debt crises, high unemployment and low wages increase (sometimes exacerbated by the austerity measures designed to solve the debt problems in the first place). The aforementioned factors, coupled with the economic effects of globalization, may pose in the near future new and serious challenges to the national security of many countries in the world. Due to the interconnections deriving from globalization, no country is totally independent and immune to such challenges.

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# Volatility Transmission between Bond and Stock Markets: Case of Emerging Financial Markets

**Amir Saadaoui[1], Younes Boujelbene[2]**

**Abstract:** This paper investigates the transmission of market volatility between the emerging stock and bond markets. In order to examine this relation between the bond and stock market, we use the BEKK GARCH model; a decomposition approach of the multivariate GARCH (1, 1) model. The outcome of this study displays a significant relation between bond and stock index and the incidence of the interest rate in this transmission. Besides, there is a transmission of volatility between the bond and stock index demonstrated by the DCC GARCH graph.

**Keywords:** Volatility transmission; Multivariate GARCH (1, 1) BEKK; Bonds; Stock Market

**JEL Classification:** C32; F30; G12; G15

## 1. Introduction

Several studies investigated the comovement between the stock index and bonds by prescribing the presence of volatility transmission. Although a consensus to causation and prediction has yet to be reached. Volatility inducing events such as the subprime crises cause an acute convergence of investors' behavior and may lead of the transmission of price variance between the bonds and stocks across the developed and emerging markets. In this context, there are several studies which focused on the volatility transmission between the stock index and bonds markets. Merton (1974) is the pioneer who studied this kind of relationship. However, Jayech et al. (2011) indicate a financial contagion presence during the crisis of 2007. Therefore, this crisis may affect the relation between the bond and stock index of the emerging markets. The study of the transmission of volatility between the bond and stock markets is considered as a central focus in many recent studies.

A growing number of empirical studies (Johansson2010, Steeley 2007, Fang and Lim 2009) mainly explore the relation linking the stock market and bond market

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and suggest that volatility transmission exists. Many empirical proofs show a negative correlation between the stock index and bonds, (Shiller and Beltratti (1992), Kwan, Campbell and Ammer (1993)).

The change of the correlation amid international the stock markets over time is explained by different studies. Voronkova (2004), Bekaert and Harvey (2003); Bekaert and Harvey (2000) Errunza and Losq (1985) showed that the relationship across international stock markets index is not constant over time whether in economic, politic and market situations. On the other hand, Corhay et al. (1995) found no evidence of a correlation in their study about Australia, Japan, Hong Kong, New Zealand and Singapore markets. Nath and Verma (2003) studied the stock market of some Asian countries and initiated no correlation between these indices. Cheung and Mak (1992) and Masih and Mash (1997) established that the correlation of international stock markets is strong. They definitely instituted that the US market is a global factor moving both the developed and emerging markets.

## 2. Literature Review

A vast empirical literature documented a high correlation between the bond and stock markets. Indeed, recent studies have been interest in the volatility transmission across the stocks and bonds in the emerging financial markets. Johansson (2010) examined the correlation between stocks and bonds in nine Asian countries. Spending a bivariate stochastic volatility model, there is a significant effect between the stock and bond markets in most of these countries. Moreover, dynamic correlation patterns show that this relationship changes considerably over time in most of the countries.

Similarly, Connolly, Stivers and Sun (2005), Li (2004) and Jones and Wilson (2004) studied the relationship between the stock and bond indices based on their changes over time.

On the other hand, some studies explain the comovement between the stock index and bond market by using the multivariate GARCH model to study the existing interrelation between these two assets in the U.S and Europe (Christiansen (2008)), to show that the covariance of the stocks and bonds is contingent on the type of shocks (De Goeij and Marquering (2004)).

This correlation was an objective for many studies. Bekaert and Harvey (1995), Bekaert (1995), Forbes and Rigobon (2002) and Johansson and Ljungwall (2009) have converging ideas about the comouvements effects between the different stock markets. In contrast, limited literatures are concentrated on the correlation between the international bond markets. Johansson (2008), for example, studied the correlation between four emerging Asian bond markets as well as their dynamic

relationship structure. Skintzi and Refenes (2006) examined the relationship between bonds in more developed markets such as the correlation between the European and the US markets and the individual European markets.

The empirical evidence presented by Shiller and Beltratti (1992), Kwan, Campbell and Ammer (1993) shows a negative interaction, albeit to varying degrees.

On the other hand, Campbell and Ammer (1993) study the correlation between the stock and bond returns and found traditional fundamental e□ects. Fleming et al (1998), considered two distinct e□ects in the evaluation of volatility linkages between the stock and bond markets. It is also well known that the stock and bond returns are positively correlated. To explain the increase in bond returns, Campbell and Taksler (2003) presented new evidence on this phenomenon by using equity volatility.

Generally, some studies proposed a correlation between the stock and bond returns on an aggregate level, while limited evidence present minor disparities. In accordance with the conventional potentials model, Shiller and Beltratti (1992) found substantial evidence on strong negative correlation variability in the real stock prices and long-term interest rates of the U.S. and U.K. financial markets. Caporale et al. (2002) used the test for the East Asian markets and found a correlation between the stock indexes and the exchange rates volatility.

Besides, Alaganar and Bhar (2003) observed causality both the mean and variance of the financial sector returns and short-term interest rates of the G7.

Hamao et al. (1990) and Koutmos and Booth (1995) and other researchers examined the interdependence of the equity market volatility, typically using mainly the framework of generalized autoregressive conditional heteroscedasticity (GARCH) time series models.

However, there are a few studies that explained the interdependence of the international bond markets. Ilmanen (1995) cast-off a linear regression model to estimate the unrestraint returns of long-term international bonds. The excess returns were highly correlated to indicate a significant integration across the transnational bond markets. In the same context, Clare and Lekkos (2000) used a VAR model to amount the interaction between the US, UK and German bond markets, and found that transnational factors are more important during times of instability. Driessen et al (2003) examined the bond markets of the US, Japan and Germany using a principal components analysis method.

The role of the interest rates in the transmission of volatility between bond and stock market has been the focus of many studies. These studies used a simultaneous analysis of the bond prices, short-term interest rates and equity markets, Rigobon and Sack (2003b) discovered that the causality of the

transmission process may run in different directions, such as the correlation between the US short-term interest rates and the equity prices swing from positive to negative at which asset prices are dominant in crisis periods.

Similarly, Dungey and Martin (2001) studied the contagion across different countries and financial markets. They studied essentially the correlation between the short-term interest rates and the stock market index in different countries.

In the same context, Steely (2006) established a correlation between the stock, bond and interest rate returns in the UK. Most of these studies demonstrated that the sovereign bonds in the US interest rates affect significantly several emerging bond markets.

## 3. Data and Methodological Approach

### 3.1. Data

To determinate the relationship between the bond and stock markets, we employ daily data of the stock and bond indices for Argentina, Australia, Greek, Hong Kong, Hungary, Mexico, Peru, Spain, Turkey and Polanda, over the period of 7/30/2009 to 18/01/2011. Since this period includes the subprime crisis period, this study employs data from two sources. The closing price data of the bond market indexes and the interest rates are provided by Datastream database. The data of the stock market index are drawn from Econostats.

This sample period encapsulates volatility inducing events such as the subprime crises in which appeared in the summer of 2007 in the United States.

This period is characterized by the volatility of interest due to the subprime crisis which hit the mortgage market in the United States and subsequently became a financial crisis that affected all the financial markets worldwide.

### 3.2. Methodological Approach

The transmission of volatility between the bond and stock markets has become the major topic in the financial studies in recent years. Thus, at first, we inspect the relation between bond and stock markets.

A negative correlation between stocks and bonds is demonstrated in the empirical evidence presented by Shiller and Beltratti (1992), Kwan (1996) and Campbell (1993). While the methods used in their study are robust, however, they did not care about the informational role of the variance in financial time series. This motivates us to investigate the causality between both assets via temporal volatility.

In addition, the variance of returns indicates the flow of information among investors. Therefore, if causality is observable in variance, these assets (and their markets) should be information-linked.

Cheung and Ng (1996), Caporale et al. (2001) and Bhar (2003) developed several variations of measuring causality-in-variance.

Instead of using the GARCH (1, 1), Bhar (2003) employed the Markov Switching process to model conditional variances (on stock returns) based on an unobserved state. The model estimation relies on a probability weighted maximum likelihood function, and allows a smooth distribution of conditional variances that are suitable for a causality-invariance test.

Caporale et al. (2001) and Cheung and Ng (1996) used the BEKK model, which parameterizes conditional variances, covariance and their cross-correlation. Properly, the model is applicable to two or more variables in two moments, while not requiring excessive parameter estimation, and reduces complications of reconfiguration (inherently VAR). However, the quadratic specification helps us treat problematic negative covariance matrices faced by other specifications (such as the VECH) without difficulty.

In order to analyze the volatility spillover effect, we used a multivariate GARCH model. More specifically, we used the BEKK model proposed by Engle and Kroner (1995).According to Wang (2009), the BEKK model can be written as:

$$H_t = A_0 A_0^{'} + A_i^{'} \varepsilon_{t-i} A_i + B_j^{'} H_{t-j} B_j \qquad (1)$$

Where $A_0$ is a symmetric (N×N) parameter matrix, and $A_i$ and $B_j$ are unrestricted (N×N) parameter matrices. This specification allows the conditional variances and covariances of the time series to influence each other, and at the same time, does not require estimating a large number of parameters. For Wang (2009), based on the symmetric parameterization of the model, $H_t$ is almost surely positive provided that $A_0 A_0^{'}$ is positive (Tsay, 2010). Wang (2009) writes the variances and covariances explicitly as:

$$h_{11,t} = \alpha_{11,0} + (\alpha^2_{11,1}\varepsilon^2_{1,t-1} + 2\,\alpha_{11,1}\alpha_{21,1}\,\varepsilon_{1,t-1}\varepsilon_{2,t-1} + \alpha^2_{21,1}\varepsilon^2_{2,t-1}) + (\beta^2_{11,1}\,h_{11,t-1} + 2\beta_{11,1}\,\beta_{21,1}\,h_{12,t-1} + \beta^2_{21,1}\,h_{22,t-1}) \qquad (2)$$

$$h_{22,t} = h_{21,t} = \alpha_{12,0} + [\alpha_{11,1}\alpha_{12,1}\varepsilon^2_{1,t-1} + (\alpha_{12,1}\alpha_{21,1} + \alpha_{11,1}\alpha_{22,1})\,\varepsilon_{1,t-1}\varepsilon_{2,t-1} + \alpha_{21,1}\alpha_{22,1}\varepsilon^2_{2,t-1}] + [\beta_{11,1}\,\beta_{21,1}\,h_{11,t-1} + (\beta_{12,1}\,\beta_{21,1} + \beta_{11,1}\,\beta_{22,1})\,h_{12,t-1} + \beta_{21,1}\,\beta_{22,1}\,h_{22,t-1}], \qquad (3)$$

$$h_{22,t} = \alpha_{22,0} + (\alpha^2_{12,1}\varepsilon^2_{1,t-1} + 2\,\alpha_{12,1}\alpha_{22,1}\,\varepsilon_{1,t-1}\varepsilon_{2,t-1} + \alpha^2_{22,1}\varepsilon^2_{2,t-1}) + (\beta^2_{12,1}\,h_{11,t-1} + 2\beta_{12,1}\,\beta_{22,1}\,h_{12,t-1} + \beta^2_{22,1}\,h_{22,t-1}), \qquad (4)$$

The diagonal elements of the matrix, $h_{11}$ and $h_{22}$, evaluate the impact of the shock of one series on the volatility of the other. This impact could be asymmetric or only one way effective (Wang, 2009). The parameters $\alpha_{11,1}$ and $\alpha_{22,1}$ represent the effect of the shock on the future uncertainty of the same time series and $\alpha_{21,1}$ and $\alpha_{12,1}$ represent the cross effect. If $\alpha_{11,1}$ and $\alpha_{21,1}$ have different signs, then the shocks with different signs in the two time series tend to increase the future uncertainty in the first time series. In the same way, if $\alpha_{12,1}$ and $\alpha_{22,1}$ have different signs, the future uncertainty of the second time series might increase if the two shocks have different signs (Wang, 2009).

We also used the DCC GARCH to estimate the transmission of volatility between the bond and stock market. The result of this estimation is demonstrated in the graph below.

Table 1 present statistical summaries and preliminary diagnostics for the daily returns of all the stock and bond indices and the interest rate for the sample period from July 30, 2009 to January 31, 2011.

## 4. Empirical Results

### 4.1. Descriptive Statistic

Table 1 presents the basic statistical properties of the data of 10 emerging financial markets. The average returns of the stock indexes are positive but very low for most countries (except for Greece and Hungary, are negative). Peru and Argentina have the maximum average returns regarding the other countries. The same applies to the bond index (except for Greece and Mexico, are negative). Turkey and Argentina have the maximum average returns compared to the other countries.

The coefficients of skewness are different from zero for all the indexes and for all the countries, which reflects the asymmetry of returns. The high frequency of large negative returns compared with large positive returns can explain this result. Similarly, the coefficients of kurtosis are largely higher than 3 for all the bond and stock indexes, which confirms the high occurrence of extreme values. We conclude that the empirical distribution of all the returns series is leptokurtic. Therefore, the Jarque-Bera test rejects the normality of the return series.

**Table 1. Descriptive Statistic**

| | Argentina | Australia | Greece | Hong Kong | Hungary | Mexico | Peru | Poland | Spain | Turkey |
|---|---|---|---|---|---|---|---|---|---|---|
| *Stock Index* | | | | | | | | | | |
| Mean | 0.002 | 0.001 | -0.001 | 0.005 | -0.001 | 0.001 | 0.045 | 0.002 | 3.47e-05 | 0.001 |
| Max. | 0.071 | 0.0258 | 0.091 | 0.032 | 0.198 | 0.026 | 3.859 | 0.058 | 7.50e-05 | 0.071 |
| Min. | -0.060 | -0.031 | -0.066 | -0.048 | -0.104 | -0.033 | -4.246 | -0.071 | 2.47e-05 | -0.055 |
| Skewness | -0.247 | -0.118 | 0.225 | -0.298 | 1.350 | -0.492 | -0.247 | 0.018 | 1.504 | 0.003 |
| Kurtosis | 5.471 | 3.455 | 4.428 | 3.244 | 18.283 | 4.276 | 4.383 | 4.054 | 3.263 | 5.150 |
| Jarque-Bera | 98.192 | 4.076348 | 34.70493 | 6.460 | 3832.755 | 40.267 | 26.184 | 17.20977 | 140.9943 | 71.646 |
| p-value | 0.000*** | 0.130* | 0.000*** | 0.035** | 0.000*** | 0.000*** | 0.000*** | 0.001*** | 0.000*** | 0.000*** |
| *Bond Index* | | | | | | | | | | |
| Mean | 0.001 | 6.26e-05 | -0.000576 | 9.18e-07 | 0.000176 | -0.003 | 0.001 | 0.002 | 4.10e-05 | 0.002 |
| Max. | 0.234 | 0.015153 | 0.233905 | 0.007181 | 0.032255 | 0.018 | 0.021 | 0.020 | 0.007 | 0.243 |
| Min. | -0.040 | -0.017425 | -0.053397 | -0.006674 | -0.023819 | -0.028 | 0.000 | -0.015 | -0.005 | -0.198 |
| Skewness | 12.311 | 0.030808 | 9.713373 | -0.171099 | 0.257568 | -2.025 | 12.687 | 0.274 | -0.077 | 0.543 |
| Kurtosis | 187.940 | 4.184433 | 157.3940 | 4.474657 | 8.637368 | 24.444 | 170.149 | 3.744 | 13.075 | 7.620 |
| Jarque-Bera | 538093.9 | 21.80350 | 376712.4 | 35.52157 | 498.0786 | 7381.700 | 346566.3 | 13.239 | 1569.665 | 349.193 |
| p-value | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.001*** | 0.000*** | 0.000*** |
| *Interest Rate* | | | | | | | | | | |
| Mean | 11.238 | 5.324194 | 2.792451 | 0.340444 | 5.253690 | 5.771 | 0.341 | 3.153 | 30.003 | 9.614 |
| Max. | 13.125 | 5.7 | 3.3585 | 0.66 | 8.075 | 6.455 | 0.54 | 5.481 | 44.4 | 11.32 |
| Min. | 10.625 | 4.25 | 2.014 | 0.15 | 0.36 | 4.86 | 0.25 | 2.563 | 20.50 | 8.42 |
| Skewness | 1.490 | -1.057490 | -0.421910 | 0.202190 | -0.091575 | -0.314 | 0.918 | 3.803 | 0.332 | 0.198 |
| Kurtosis | 4.272 | 3.702358 | 1.945715 | 2.134307 | 4.516109 | 1.721 | 2.283 | 28.744 | 2.929 | 2.218 |
| Jarque-Bera | 162.373 | 76.97595 | 28.13890 | 14.13729 | 36.15258 | 31.431 | 47.169 | 11170.30 | 6.378 | 11.504 |
| p-value | 0.000*** | 0.000*** | 0.000*** | 0.001*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.032** | 0.002*** |

***indicates significance at the 1 percent level ** at 5 percent * at 10 percent

## 4.2. Correlation Analysis between Bond and Stock Market Index

The result reports the domestic cross-market influences between the bonds and stocks for ten emerging countries in the presence of an interest rate determinant. In order to compensate for any biasness that may arise, we restricted our inferences to 1 per cent significance, as suggested by Karolyi (1995).

The results indicate that in domestic emerging markets, the government bonds have in influence on the domestic stock market in variance. Overall, the results indicate that the GARCH (1, 1) specification captures satisfactory the persistence in the squared return series.

Table 2 shows the result of the transmission of volatility between the bonds and stocks of the emerging markets in the presence of the interest rates as a transmission channel. The result shows that there is a transmission of the volatility of the bond market to the spot markets. This transmission occurs in two stages, at the average coefficients expressed by $\alpha_{21}$ and $\alpha_{31}$ and at variance $\beta_{21}$ and$\beta_{31}$.

The estimate of $\alpha_{21}$ in the emerging market is statistically significant at 1% level in most countries as shown in the table. This suggests that a 1 percent increase in the volatility of the bond market causes its own stock market volatility to decrease (increase) by α%.

These tables show that the transmission of volatility, on average, between domestic bond and stock markets is statistically significant. The results indicate that the coefficient $\alpha_{21}$measuring the mean spillover from the bond market to stock Market is significant in the majority of the countries, as shown in the tables above.

The results also show that the correlation between two asset classes changes over time and correlation between the emerging bond and stock markets is indeed time varying in nature. This varying is explained by moves between positive and negative values. In addition, the bond-stock correlation tends to increase during periods of market turmoil for most countries. This result confirms those shown by Johansson (2009).

Most of the studies show a comovement volatility between the stock and bond markets, whereas our study shows a comovement between bond and stock domestic emerging markets.

The majority of the empirical studies (Granger and Morgenstern, 1970; Arshanapalli *et al.*, 1995; Malliaris and Urrutia, 1992; Hon, Strauss and Yong, 2006; Khalid and Rajaguru, 2007; Huyghebaert and Wang, 2010) show that the comovement patterns of national stock markets change significantly after major economic events such as crises. These results confirm our work**.**

The result also shows that the uncertainty in the bond and stock markets has a significant effect on the existing correlation between these two assets. Our study shows that the correlation structure between the bond and stock market varies over time and manly during periods of financial turmoil. This result confirms the work done by Hartmann, Straetmans and De Vries (2001), Gulko (2002), and Baur, Lucey (2009).

Moreover, the evidence shows that the volatility transmission is bidirectional between domestic cross-markets in the sense that the domestic bond market tends to exert influence over the domestic stock market and vice versa.

In our study, we used the interest rate as a transmission channel. The results showed that there is relationship between the interest rates and stock indices in average expressed by the coefficient $\alpha_{31}$ or in variance expressed by the coefficient$\beta_{31}$ as shown in Table 2.

The correlation between the interest rates and the stock indexes, may explain that the interest rates have an essential role in the transmission of the shock of a mortgage crisis to a financial crisis. This crisis affected almost all the financial markets and primarily the emerging markets, such as the Greece market.

**Table 2. Results of transmission volatility between bond and stock index in the presence of interest rate**

| | Argentina | Australia | Greece | Hong Kong | Hungary | Mexico | Peru | Spain | Turkey | Poland |
|---|---|---|---|---|---|---|---|---|---|---|
| $c_{12}$ | (0,0784) | (-0,0142) | (0,023) | (0,004) | (0,027) | (0,738) | (0,000) | (-0,000) | (0,001) | (0.007) |
| | 0,000*** | 0,534 | 0,000*** | 0,629 | 0,010*** | 0,000*** | 0,000*** | 0.000*** | 0,826 | 0.045** |
| $c_{13}$ | (-0,3951) | (-0,0391) | (-13,832) | (-0.134) | (-7,710) | (2,113) | (0,001) | (-0,083) | (-0,064) | (-0.291) |
| | 0,000*** | 0,140 | 0,000*** | 0,054** | 0,000*** | 0.053** | 0,1171 | 0.165 | 0,956 | 0.460 |
| $c_{21}$ | (-3,9997) | (0,2082) | (-0.240) | (-1.420) | (-0,410) | (0,505) | (1671,930) | (-233,153) | (0,020) | (1.993) |
| | 0,000*** | 0.015*** | 0,069 | 0,000*** | 0,339 | 0,000*** | 0,000*** | 0.001*** | 0.050** | 0.124 |
| $c_{22}$ | (-4,9954) | (0,0248) | (-221,573) | (-0.256) | (17.617) | (-3,142) | (-10,027) | (-17.998) | (-0,218) | (29.115) |
| | 0.036** | 0,423 | 0,000*** | 0,627 | 0,000*** | 0,000*** | 0,000*** | 0.599 | 0,657 | 0.001*** |
| $c_{31}$ | (0,0011) | (-0,0014) | (0,000) | (-0.045) | (0,003) | (0,056) | (-0,411) | (-0,317) | (0,000) | (0.000) |
| | 0,000*** | 0.009*** | 0,000*** | 0,391 | 0,357 | 0,000*** | 0.022** | 0.000*** | 0,000*** | 0.121 |
| $c_{32}$ | (0,0005) | (-0,0011) | (0,000) | (-0.023) | (0,000) | (-0,038) | (0,001) | (-0,000) | (0,000) | (-0.000) |
| | 0,000*** | 0.009*** | 0,000*** | 0,004*** | 0,578 | 0,014*** | 0.057** | 0.932 | 0,977 | 0.000*** |
| $\beta_{12}$ | (-0,0012) | (0,1355) | (-0.004) | (0,059) | (0,035) | (0,672) | (0,000) | (-0,001) | (-0,010) | (-0.013) |
| | 0,188 | 0.014*** | 0,002*** | 0,000*** | 0,076 | 0,000*** | 0,000*** | 0.000*** | 0,126 | 0.000*** |
| $\beta_{13}$ | (-0,8569) | (0,2029) | (-49,753) | (0,595) | (1,040) | (0,954) | (0,000) | (-0,088) | (3,189) | (4.042) |
| | 0,000*** | 0,024** | 0,000*** | 0,000*** | 0,525 | 0,342 | 0,799 | 0.417 | 0,125 | 0.000*** |
| $\beta_{21}$ | (8,6795) | (0,3781) | (0,846) | (1,701) | (0,667) | (-0,134) | (-248.921) | (510,626) | (0,047) | (14.049) |
| | 0,000*** | 0,127 | 0,000*** | 0,000*** | 0,099 | 0,005*** | 0.026** | 0.000*** | 0,000*** | 0.000*** |
| $\beta_{23}$ | (-3,9460) | (0,0249) | (-191,389) | (-2.483) | (-0,285) | (-3,100) | (-2,589) | (-309,942) | (-0,089) | (-45.530) |
| | 0,672* | 0,667 | 0,000*** | 0,000*** | 0,916 | 0,000*** | 0,000*** | 0.000*** | 0,743 | 0.000*** |
| $\beta_{31}$ | (-0,0047) | (0,0097) | (-0.001) | (0,219) | (-0,038) | (0,046) | (2,561) | (0.095) | (-0,002) | (0.002) |
| | 0,000*** | 0,009*** | 0,000*** | 0,000*** | 0,000*** | 0,000*** | 0,000*** | 0,712 | 0,000*** | 0.002*** |
| $\beta_{32}$ | (0,0005) | (0,0036) | (0,000) | (0,022) | (0,000) | (-0,037) | (0,000) | (-0,001) | (-0,000) | (-0.000) |
| | 0,000*** | 0.009*** | 0,000*** | 0,029** | 0,709 | 0,000*** | 0,587 | 0.014*** | 0,671 | 0.023** |

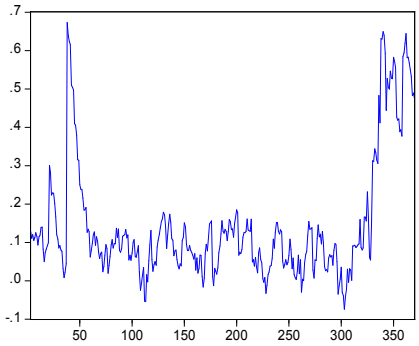
***indicates significance at the 1 percent level ** at 5 percent * at 10 percent

### 4.3. Dynamic Conditional Correlation between Bond and Stock Index

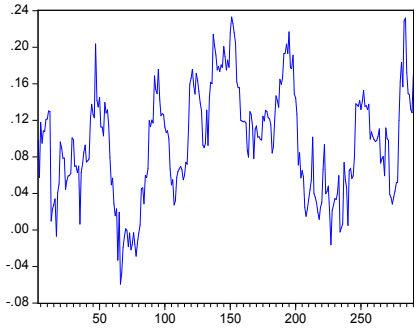
To explain the relationship between the bond and stock indexes in the emerging financial markets we use the DCC-GARCH model. The Figure plots the dynamic correlation between the bond and stock index returns during and after the subprime crisis.

We found a strong time varying evidence of negative and positive correlation between the bond and stock index. Some turmoil periods provide extremely high negative correlation, while some tranquil periods provide low correlation among these indexes. We note that the transmission of volatility varies greatly and can be positive or negative in almost all the studied countries, excepting Polanda in which there was a positive correlation.

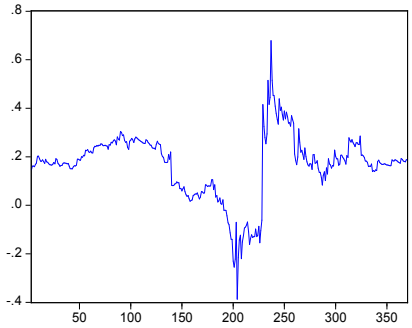
Argentina



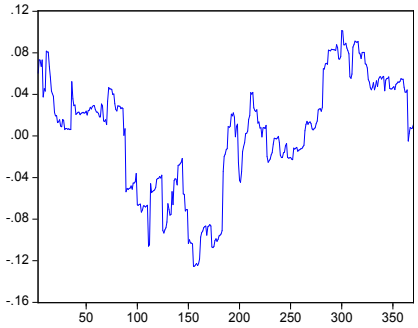

Australia



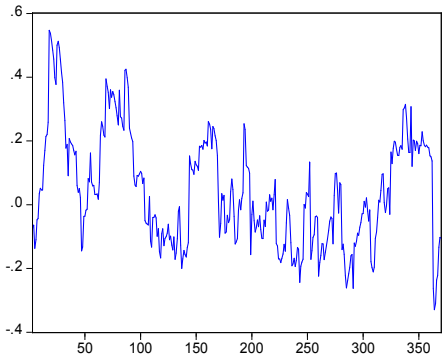

Greece



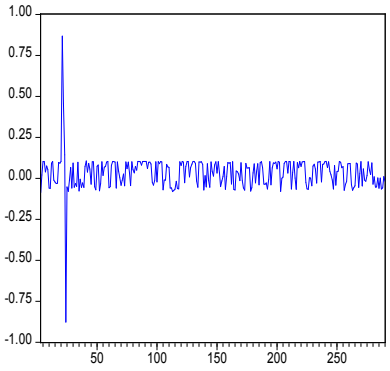

Hong Kong



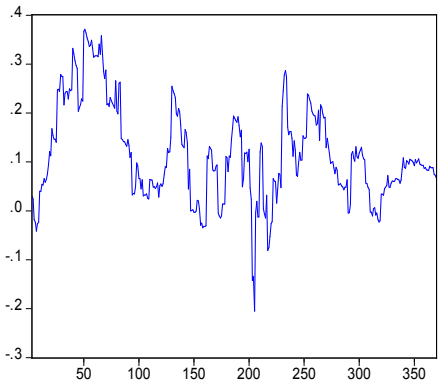
Hungary



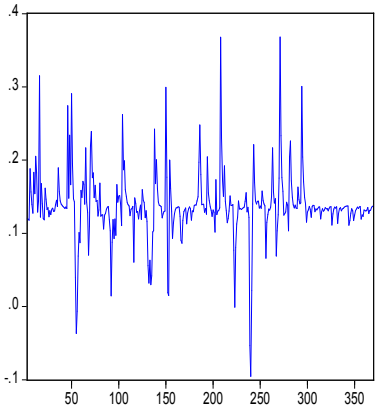

Mexico




Peru




Spain



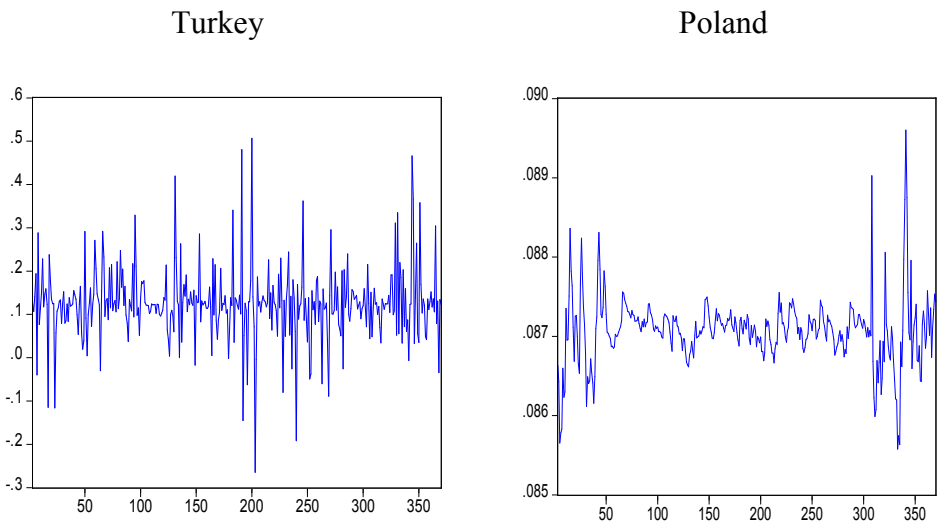



**Figure 1. The Dynamic correlation between bond and stock index for emerging financial markets**

## 5. Conclusion

This paper examines the volatility transmission between the bond and stock emerging market in the presence of the interest rates. We use the BEKK-MGARCH (1, 1) (Multivariate Garch) and the DCC-GARCH. We found a bidirectional transmission of volatility between the bond and stock market. We also found that the interest rates are the canal of transmission. This result is explained by the significant effect of the interest rates on the stock indices in mean and in variance. This result also explains the transmission of liquidity problems from the mortgage market to the financial market. This clearly explains the transmission transfer of the crisis, from a mortgage crisis to a financial crisis that hit everyone.

Our study highlights the role of the indices in the transmission of information from one market to another. The context of high interest rates (increase) is perceived resilience of the economy in the world offer us a unique opportunity to study the informational dependence between the bond and equity investors in the emerging markets. As bond yields correspond to the reference rate, it is reasonable to assume that a significant number of sophisticated investors will shape their portfolios to capitalize on the bond market countries of our sample.

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# Capital Inflow and Economic Growth Nexus in Nigeria: The Role of Trade Openness

**Olufemi Saibu**[1]

**Abstract:** The paper examined the effects of capital inflow on economic growth and also investigated the role of trade openness in foreign capital inflow/growth nexus in Nigeria. This is with a view to testing modernization hypothesis in Nigeria. The paper adopted the Principal Component Analysis (PCA) technique to derive a unique index that captures the quantity and quality of the conventional measures of capital inflow along with trade openness. The method has been used in other studies but not yet applied to capital inflow versus growth analysis. The time series properties of the data were examined and Autoregressive Distributed Lag (ARDL) bound testing methodology was used to analyze the time series data. The result showed that capital inflow when interacted with trade openness had significant impact on growth, thus providing empirical support for the modernization hypothesis that capital inflow and trade policy are complementary and growth enhancing. The paper concluded that trade liberalization policies tend to enhance effectiveness of capital inflow and jointly promote higher economic growth in Nigeria.

**Keywords:** Liberalization Policy, Modernization Hypothesis, Growth, Factor Analysis, ARDL

**JEL Classification:** C82; F21; F35; F43; N17

## 1 Introduction

The relationship between foreign capital and economic growth has for long been a debated issue in the finance literature. While a substantial number of studies documented a positive relationship between foreign capital and economic growth (Osinubi and Amaghionyeodiwe, 2010; Khadraoui, 2012; Odhiambo, 2011; and Ndambendia and Njoupouognigni, 2010), several other studies have equally observed either a negative relationship or ambiguous effect of capital inflows on economic growth (Akinlo 2004, Burke and Ahmadi-Esfahani, 2006; Alfaro et al., 2001; and Shahbaz and Rahman, 2010).

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The relationship between trade openness and economic growth has also generated similar controversy as capital inflows, though in this case, the balance of evidence tilted towards positive and significant trade effects on real growth (Dollar and Kraay, 2000; Damooei and Tavakoli, 2006; Aryeetey, 2005; and Kasuga, 2007). However a critical look at the methodological approaches adopted in these studies show that lack of consensus in the empirical results from existing studies arose from how foreign capital is measured and incorporated into the model. More specifically, it was observed that when foreign capital is interacted with other growth fundamentals like trade openness, physical and human capital produce stronger and more robust estimates of positive effects on economic growth were observed ( Kumar 2010, Li and Liu, 2005; Fayissa and Nsiah , 2010; and Sakyi, 2011).

This paper takes a new look at how capital inflow is captured and incorporated into the endogenous growth model as a way of addressing the observed lapses in the existing literature. The paper contributes to the empirics of capital inflows and growth in three ways. First, it contributes to literature by focusing attention on a unique country case study –Nigeria-unique in the sense that not only has there been little empirical studies on impact of capital inflow in the country, but also that it combines crucial attributes of being one of the top recipients of capital inflows in Africa (Castilleja-Vargas Liliana, 2009), but yet is a country that has experienced unimpressive real inclusive economic growth characterized by dismal development statistics despite the huge amount of both domestic and foreign resources inflow (Iwayemi, 2012). Secondly, the paper probes into the possible differential impact of different aspect of capital inflow and their interaction with trade policy orientation unlike existing studies on Nigeria (Odhiambo, 2011; Akinlo, 2004; Osinubi and Amaghionyeodiwe, 2010) which used a single measure of capital inflow.

More importantly, the paper builds a composite indicator of capital inflows derived from PCA in the Autoregressive Distributed Lag (ARDL) modelling environment to explore the interactive effects of capital inflow and trade openness on economic growth for a country-specific case study using Nigeria's data series for the period, 1960 to 2010. Thus providing another opportunity to test the robustness of the PCA method and also contributes to literature on capital inflow and economic growth in Nigeria. The remainder of this paper is organized as follows: Section 2 presents the analytical framework while section 3 deals with the methodological approaches adopted for the study. Section 4 presents the empirical results while section 5 concludes with policy implications.

## 2. Theoretical Framework

The endogenous-growth AK model developed by Rebelo (1991) and adapted by Pagano (1993) in analysing finance-growth nexus serves as the starting point of the model used in this paper. The model expresses output as a function of total productivity and capital stock:

$$Y = AK_t \quad (1)$$

*Where Y, A and K denote the output, total factor productivity and capital respectively*

The model assumes excess labour supply and production is constrained only by the quantity and quality of capital. The financial system acts as the intermediating units of which part of the capital is also consumed by financial system hence not all capital mobilized get to the real productive sector. The amount of investable capital is determined by the efficiency of financial intermediation ($\phi$) since a certain amount of the total domestically mobilized investible savings ($1-\phi$; $0<\phi<1$) which represents the cost of financial intermediation per unit of savings is consumed by the financial market system. This indicates that only the fraction $\phi$ of total domestic savings is available for investment (Bailliu (2000)). Given this constraint, the long run economic growth rate is expressed as a function of total factor productivity, efficiency of financial intermediation and the saving rate:

$$g = A\left(\frac{I}{Y}\right) - \delta = \phi s - \delta, \quad (2)$$

*Where $\delta$ is the rate of depreciation, $\phi$ is the proportion of saving converted to investment and s denotes the gross savings rate. Y is output and I is change in capital. A is the factor productivity and g is the output growth.*

Equation (2) represents a closed economy which does not account for capital inflows. To incorporate capital inflows, we assumed that foreign residents invest in the domestic economy and foreign donors grant financial aids to the recipient economy to augment the deficiency in domestic savings. If capital flows in, on net, then a larger pool of savings is available for investment than in the absence of net capital flows (NCF). Following Bailliu (2000), the capital market equilibrium

($\phi s_t = I_t$) in the closed economy then becomes:

$$\phi * (S_t + NCF_t) = I_t^* \quad (3)$$

And the long run economic growth rate becomes:

$$g^* = A^* \frac{1^*}{Y} - \delta = A^* \phi^* \left( \frac{S + NCF}{Y} \right) - \delta = A^* \phi^* (s + ncf)^* - \delta \quad (4)$$

Equation (4) depicts the various ways capital inflow can influence the long run growth in a small but open economy. For example ($\phi^* > \phi$) implies that the inflow of capital makes the local firms more efficient and with higher factor productivity (A*>A) if, the new capital inflow leads to higher investment rate with positive spill-over and higher country competitiveness (Bailliu (2000) Damooei and Tavakoli, 2006). Trade liberalization policy can also augment inflow of capital through trade. Total trade consists of both capital goods and consumer goods and hence trade liberalisation policy, that allows for free flows of capital goods, helps developing countries overcome some of the domestic resource constraints. Thus trade, stimulates competition, promotes realization of comparative advantage, expand access to varieties of inputs and opportunities to gain access to new technology as well as managerial skills. Translating this theory into empirical specification and incorporating trade openness and other growth macroeconomic environment or factor endowments, the general formulation of equation (4) becomes:

$$\Delta Y_t = \alpha_0 + \beta_{1i} \Delta Z_{it} + \beta_{2i} \Delta CF_{it} + \beta_3 \Delta OPEN_t + e_t \quad (5)$$

$\Delta Y$ is the real output growth rate, $Z$ represents other possible macroeconomic growth conditioning variables. The other macroeconomic variables (Z) included are employment level (LAB measure as share of active labour force in the population) and aggregate domestic saving (GDS). CF (= FDI, AID, OCF). FDI is Foreign Direct Investment, while AID is total foreign aid which includes both official development assistance (ODA) and OCF is other capital inflows variables while Trade openness (OPEN) is measured, as (imports + exports)/GDP (Javid and Qayyum 2011 and Kargbo 2012). $\boldsymbol{e}$ is a normally distributed error term..

Theoretically it is expected that trade openness variable should have a positive co-efficient. According to modernization hypothesis, coefficient on FDI should be positive. But dependency hypothesis would expect the coefficient on FDI to be uncertain. The same follows for the AID and OCF variables. Finally, the coefficients on GDS and LAB in standard growth are expected to be positive (Obwona, 2001). Therefore $\beta_{1i}$, $\beta_{2i}$, and $\beta_3$ should be positive and significantly different from zero. To check whether trade policy liberalization, as an alternative measure of policy orientation and good institutional environment, plays any role in the effectiveness of foreign capital inflow, an interactive variable representing the

product of the capital inflow and trade openness is included and equation 5 becomes:

$$\Delta Y_t = \alpha_0 + \beta_{1i} \Delta Z_{it} + \beta_{2i} \Delta CF_{it} + \beta_3 \Delta OPEN_t + \beta_{4i} \Delta CF * OPEN_{it} + e_t \quad (6)$$

Theoretical hypothesis is that $\beta_{4i} > 0$, if trade liberalization policy as good policy orientation and institutional environment enhances the effectiveness of both foreign direct investment and foreign aids.

## 3. Analytical Techniques

### 3.1 Deriving Capital inflow index

The PCA technique is used to build an aggregate index summarizing information on the quantity and quality of the conventional measures of capital inflow along with trade openness. This method has been used in several other similar studies but not yet applied to capital inflow versus growth analysis. For instance, Alesina and Perotti (1996) use PCA to create a measure of political instability while Sanchez-Robles (1998) and Calderon and Poggio (2010) employed it to build an aggregate index of infrastructure. Creane et al. (2003), Gries et al. (2009) Abdul Jalil et al. (2010) and Gounder (2012) used it to build a single measure of financial market development.

Following the procedure used in Ionita and Schiopu (2010), the paper in similar manner derives a new series with the aid of Principal Component Analysis (PCA) technique that captures most if not all the variability in the capital inflow variables and at the same time overcomes the possible multicollinearity and degree of freedom that might occur if all the selected variables are used in a specified model. The PCA transforms correlated variables into a smaller number of uncorrelated variables called principal components, while retaining most of the original variability in the data set.

As a prelude to the use of PCA, the correlation for the variables is examined. Table 1 presents the correlation matrix for the selected capital inflow variables. The correlation coefficients among the variables are relatively high especially between AID and OCF and between Trade openness (OPEN) and FDI. If all the variables are used simultaneously in the model, there is high possibility of multicollinearity, which may lead to incorrect inferences. In order to overcome this problem, the principal components for the selected capital inflow variables are estimated. Table 2a and 2b report the results of the PCA for the individual variables and their interactive terms respectively.

**Table 1. Correlation Matrix**

| | FDI | OCF | AID | OPEN | FDI*OPEN | AID*OPEN |
|---|---|---|---|---|---|---|
| FDI | 1.000 | | | | | |
| OCF | 0.612 | 1.000 | | | | |
| AID | 0.672 | 0.902 | 1.000 | | | |
| OPEN | 0.969 | 0.551 | 0.651 | 1.000 | | |
| FDI*OPEN | 0.937 | 0.516 | 0.592 | 0.972 | 1.000 | |
| AID*OPEN | 0.763 | 0.878 | 0.981 | 0.762 | 0.960 | 1.000 |
| OCF*OPEN | 0.684 | 0.990 | 0.900 | 0.640 | 0.922 | 0.904 |

**Table 2a.Principal Components Analysis for the individual Variables**

| *Principal Component* | *Eigenvalues* | *Difference* | *% Variance* | *Cumulative value* | *Cumulative %* |
|---|---|---|---|---|---|
| 1 | 2.829800 | 2.664549 | 0.9433 | 2.829800 | 0.9433 |
| 2 | 0.165250 | 0.160301 | 0.0551 | 2.995050 | 0.9984 |
| 3 | 0.004950 | --- | 0.0016 | 3.000000 | 1.0000 |
| | *Eigenvectors (Factor Loadings)* | | | *Ordinary Correlations* | |
| *Variable* | *PC 1* | *PC 2* | *PC 3* | *FDI* | *AID* |
| FDI | 0.591541 | -0.202543 | -0.780420 | 1.00000 | - |
| AID | 0.577847 | -0.568532 | 0.585547 | 0.913711 | 1.000000 |
| OCF | 0.562292 | 0.797338 | 0.219271 | 0.845181 | 0.984049 |

**Table 2b Principal Components Analysis for the Interactive Terms**

| *Principal Component* | *Eigenvalues* | *Difference* | *% Variance* | *Cumulative value* | *Cumulative %* |
|---|---|---|---|---|---|
| 1 | 2.916055 | 2.834277 | 0.9720 | 2.916055 | 0.9720 |
| 2 | 0.081778 | 0.079611 | 0.0273 | 2.997833 | 0.9993 |
| 3 | 0.002167 | --- | 0.0007 | 3.000000 | 1.0000 |
| | *Eigenvectors (Factor Loadings)* | | | *Ordinary Correlations* | |
| *Variable* | *PC 1* | *PC 2* | *PC 3* | *FDI*OPEN* | *OCF*OPEN* |
| FDI*OPEN | 0.584418 | -0.181092 | -0.790988 | 1.00000 | |
| OCF*OPEN | 0.576924 | -0.592752 | 0.561965 | 0.904101 | 1.000000 |
| AID*OPEN | 0.570627 | 0.784762 | 0.241939 | 0.960422 | 0.922243 |

The reported eigenvalues in Table 2 indicate that the first principal component explains about 94% and 97% of the standardized variance for the individual and interactive variables respectively. Therefore, only information related to the first principal component is used in the construction of the series. The corresponding new series from the PCA results are represented by equations (7) and (8) which are

linear combinations of the original variables using the respective factor loading as the weights.

$$FC1 = 0.592(FDI) + 0.578(AIDS) + 0.562(OCF) \quad (7)$$

$$FC2 = 0.584(FDI*OPEN) + 0.577(OCF*OPEN) + 0.571(AID*OPEN) \quad (8)$$

Figure 1 plots the resulting indices of net capital inflows depicted by equation 7 and 8. The indices coincide fairly with the economic state and policy changes that happened during the sample period. Nigeria's economic historical development is well captured by the trend of this index. In the early period before the oil boom, the inflow of capital was relatively low but stable while the era of oil boom in 1970s experienced upsurge in capital inflow. This trend is truncated by the oil glut and subsequent austerity measure in early 1980s. The implementation of policy reforms and introduction investment incentives in late 1980s led to a swing in the capital inflow.

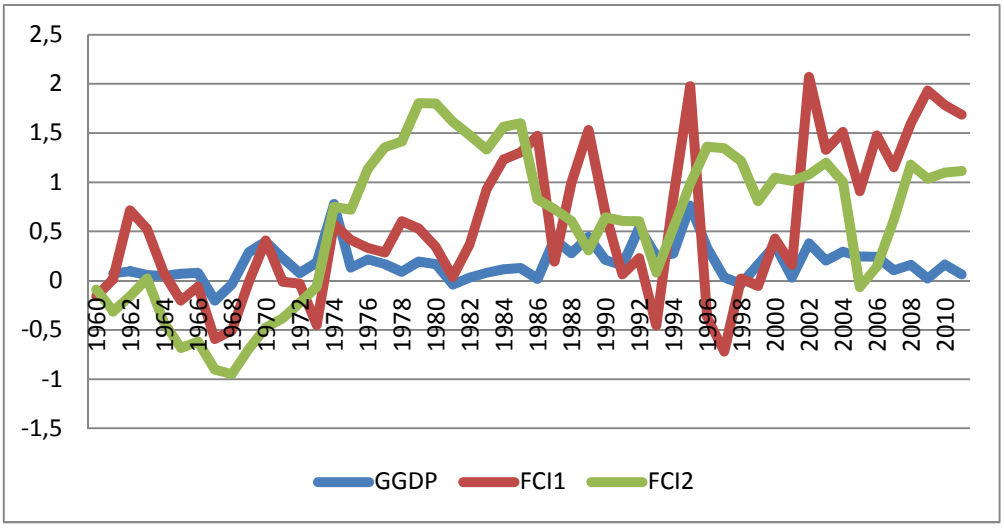


**Figure 1. Capital inflow Indices and Output Growth Rate in Nigeria**

The most remarkable policy change during this period was the introduction of the Structural Adjustment Programme (SAP), which provided the basis for deregulation of the economy (Fasanya 2012)). The SAP policy included the deregulation of the economy, the introduction of new industrial policy in 1989, the establishment of the Nigeria Investment Promotion Commission (NIPC) in early 1990s, and the signing of Bilateral Investment Treaties (BITs) in the late 1990s ( Wafure and Nurudeen, 2010). According to the UNCTAD (2007) World Investment Report, 70% of capital inflow to West Africa and 11% of Africa's total capital inflow went to Nigeria during this period and Nigeria ranked among the

first five highest recipients of capital inflow in Africa, (Eshenake and Oriavwote, 2012). The political crisis in 1993 to 1999 explained the fall in capital inflow before it resumes upward trend from 2002. The introduction of global telecommunication, which attracted high inflow of FDI into telecommunication sector and .the strengthening of financial policy from 1999 till 2009 further made Nigerian economy more attractive and this explains the sharp increase in private investment inflow and Nigeria ranking second to South Africa in capital inflows between 2000-2010 (Rangasamy and Mihaljek, 2012).

### 3.2. ARDL Bound Testing Approach

Autoregressive Distributed Lag model (ARDL) developed by Pesaran et al. (2001) is used to estimate the model specified above in equation 7. ARDL yields valid results irrespective of whether the underlying variables are I(0), I(1), or a combination of both (Abdul Jalil et al., 2010). It is also asymptotically efficient in small sample study and when the regressors are endogenous (Sakyi, 2011) , thus making ARDL methodology more appropriate for estimating our model with only 51 observations. ARDL helps overcome possible endogeneity problem that may arise in a model incorporating capital inflow, trade openness and economic growth. The opportunity of introducing optimal lag structure for both the dependent and independent variables in ARDL and use of OLS to estimate the cointegration relationship whether the underlying variables are I(0), I(1) or both makes the ARDL to outperform other methods (like Engle and Granger error correction method) of estimating cointegration. The ARDL approach involves estimating equation 6 in the form:

$$\Delta Y^{i} = \alpha_0 + \sum_{i=1}^{p} \delta_i \Delta Y_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta Z_{t-1} + \sum_{I=1}^{P} \theta_I \Delta CF_{t-I} + \sum_{i=1}^{p} \psi_i \Delta OP_{t-1} + \lambda_1 Y_{t-1}$$

$$+ \lambda_2 Z_{t-1} + \lambda_3 CF_{t-1} + \lambda_4 OP_{t-1} + U_t \quad \text{.....(9)}$$

*Where $\alpha_0$ is the drift component; $U_t$ is the white noise; the terms with summation signs represent the error correction; dynamics with $\delta_i$ for example represents the short run effects; while the second part of the equations with $\lambda_i$ corresponds to the long run relationship.*

Cointegration relationship in the ARDL model is established using F-test. The null hypothesis is $\lambda_i = 0$ which implies non-existence of long run relationship and the

alternative $\lambda_i \neq 0$ suggests the existence of a long run relationship. Pesaran and Shin (1999) provides two sets of asymptotic critical values bounds based on whether all the variables are I(0) for lower bound or I(1) for upper bound. The null hypothesis is rejected if the F-statistics is greater than the upper bound. If the long run relationship exists among the variables, the following error correction model is estimated:

$$\Delta Y^i = \alpha_0 + \sum_{i=1}^{p} \delta_i \Delta Y_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta FC_{t-1} + \sum_{I=1}^{P} \theta_I \Delta FCT_{t-I} + \sum_{i=1}^{P} \psi_i \Delta GC_{t-1} + \omega ECM_{t-1} + \mu_t \quad (10)$$

The $ECM_{t-1}$ is the error correction term and the coefficient of $ECM_{t-1}$ measures the speed of adjustment towards the long-run equilibrium. For a country specific study, the usual problem of data comparability, measurement issue and consistency do not arise in this case. All the variables are as defined in and sourced from the Central Bank of Nigeria (CBN)'s Statistical Bulletin, 2010 and Annual Report and Statement Account for 2011. All variables are expressed in log form in Naira, official currency in Nigeria, except labour force which is calculated as the active labour participation rate multiplied by the population size for the year.

## 4. Empirical Results and Discussion

The Autoregressive Distributed Lag (ARDL) bound testing approach procedure does not require pre-testing of unit roots and hence the order of cointegration can be determined irrespective of their order integration (Pesaran and Shin, 1999). The critical value of the ARDL Bound testing depends on selected lag length; for this reason, the optimal lag (p) is determined empirically based on Schwartz Bayesian Criterion (SBC) and Akaike's Information Criteria (AIC). Both original series and the PCA derived series are used to allow for comparison of results which lead to 5 models being estimated. Model (I) to (III) use the original data series while model (IV) and (V) use the new series ((FC1 and FC2 respectively) along with the other growth determinants included in the models. The critical values reported in Pesaran et al. (2001) are based on large sample sizes; thus, it cannot be used for small sample sizes. Narayan ( 2004) generates and reports new sets of critical values for small sample sizes ranging from 30 observations to 80 observations. Table 3 reports the result of the ARDL approach to co-integration.

**Table 3. ARDL Bound Tests for Cointegration**

| | Model I | Model II | Model III | Model IV | Model V |
|---|---|---|---|---|---|
| F-statistic | 6.09 | 5.14 | 6.24 | 5.02 | 5.147 |
| | (0.073) | (0.052) | (0.031) | (0.017) | (0.01) |
| Likelihood ratio | 20.17 | 21.01 | 20.67 | 19.89 | 20.67 |
| | (0.009) | (0.007) | (0.03) | (0.002) | (0.00) |
| % Critical Levels | Critical Values for Cointegration Bound Testing | | | | |
| 1% | 3.498 | 3.056 | 3.498 | 4.306 | 4.306 |
| 5% | 2.593 | 2.726 | 2.593 | 3.136 | 3.136 |
| 10% | 2.205 | 2.309 | 2.205 | 2.614 | 2.614 |

*Note: The critical values for unrestricted intercept and no trend obtained from :Narayan (2004, Pp25-31) AppendixA6 () :Critical values for the bounds test: Case III Restricted intercept and trend*

The computed *F*-statistics with corresponding Likelihood ratios are for the higher than the upper critical bound at 5% and 10% critical values as indicated in Table 3. Given the values of the F statistics relative to the upper and lower bound critical values, the ARDL cointegration tests therefore confirm that the null hypothesis of no long run relationship among the variables in the models is rejected and alternatively confirming that at least a long run cointegration relationship exists among the variables in the estimated ARDL models.

Table 4 and 5 present the estimates of long run and short run results respectively. For brevity and conciseness, only the estimates of the capital flow variables are reported and discussed. The results show that the model (IV) with interactive term perform better that the model (I) without interactive terms. Specifically, except foreign aid which remains insignificant and negative, the result shows FDI and other capital inflow are significant and positive when the possible interactive effect of trade openness is explicitly included which confirms that trade openness plays crucial role in the effectiveness of both FDI and other capital inflows. The error correction terms in Table 5 are negative and statistically significant as expected and they also indicate a high speed of readjustment to long run equilibrium from short run shocks.

A comparison of the results of the Models (I) to (III) with Model IV and V) of table 4 and 5 for both the long run and short run shows that using the indices derived by the PCA as alterative measures of capital flow and its interaction implies a remarkably improved statistical performance of the model in terms of efficiency and robustness. The improved performance of the new series might have removed the possible multicollinearity problems that may arise when

correlated series are used in the same model. Most of the capital flows series have tendency of high correlation as observed in the correlation result presented earlier.

**Table 4. Estimated Long Run Coefficients using the ARDL Approach**

| Regressors | Model I | Model II | Model III | Model IV | Model V |
|---|---|---|---|---|---|
| FDI | -0.01(-1.06) | | 0.27(2.57) | | |
| AID | 0.08(1.10) | | 0.27(1.63) | | |
| OCF | -0.02(-1.25) | | 0.13(2.85) | | |
| OPEN | 0.08(2.43) | | 0.01(0.07) | | |
| FDI*OPEN | | -0.11(-2.08) | 0.13(2.23) | | |
| AID*OPEN | | -0.002(-0.05) | -0.04(-0.44) | | |
| OCF*OPEN | | -0.04(-3.06) | 0.11(2.77) | | |
| FC1 | | | | 0.18(2.7) | |
| FC2 | | | | | 0.165(2.75) |
| $R^2$ | 0.58 | 0.50 | 0.53 | 0.51 | 0.51 |
| F-Stat | 3.27 | 2.60 | 3.18 | 3.15 | 3.24 |
| DW | 2.01 | 1.91 | 1.87 | 1.97 | 1.99 |

**Table 5. Estimates of Short Run ARDL Model**

| Regressors | Model I | Model II | Model III | Model IV | Model V |
|---|---|---|---|---|---|
| D(FDI(-1)) | 0.05(0.45) | | 0.24(2.24) | | |
| D(AID(-1)) | 0.08(1.82) | | 0.42(2.58) | | |
| D(OCF(-1)) | 0.37(2.07) | | 0.48(2.62) | | |
| D(OPEN(-1)) | -0.07(-0.61) | | 0.05(0.38) | | |
| D(FDI*OPEN(-1)) | | -0.12(-2.75) | 0.12(2.53) | | |
| D(AID*OPEN(-1)) | | 0.04(0.75) | 0.07(0.75) | | |
| D(OCF*OPEN(-1)) | | -0.04(-2.37) | 0.16-2.90) | | |
| D(FC1(-1)) | | | | 0.65(3.04) | |
| D(FC2(-1)) | | | | | 0.316(2.98) |
| ECM(-1) | -1.08(-4.53) | -1.05(-4.62) | -0.93(-4.1) | -1.03(-4.62) | -1.08(-4.76) |
| $R^2$ | 0.48 | 0.56 | 0.60 | 0.56 | 0.57 |
| F-Stat | 22.82 | 26.69 | 31.22 | 23.46 | 24.76 |
| DW | 1.98 | 2.01 | 1.95 | 1.97 | 1.99 |

Note: (*) and (**) implies significant at 5% and 10% level of significance respectively

The model diagnostic and stability tests carried out on the model estimates reported in Table 6 also confirms the robustness and stability of the estimated coefficients in the models. The results in the short run models in Table 5 (Model III) show that foreign aid (AID), foreign direct investment (FDI) and other capital inflow (OCF) are positive and statistically significant. This short run result

therefore suggests that foreign direct investment and other capital inflow except foreign aids have significant positive effects on economic growth in the short run. The insignificant effect of foreign aids in the long run model corroborates the observation by Clements et al (2004) that even if foreign aid has no robust long run effect on economic growth, in the short run, foreign aids like other capital inflows could be growth enhancing.

**Table 6. Diagnostic Tests Statistics**

| Regressors | Model I | Model II | Model III | Model IV | Model V |
|---|---|---|---|---|---|
| Serial Correlation | 0.84 (0.437) | 0.43 (0.651) | 0.07 (0.923) | 0.44 (0.646) | 0.85 (0.433) |
| Functional Form | 8.15 (0.999) | 0.05 (0.820) | 0.10 (0.747) | 2.32 (0.632) | 0.04 (0.838) |
| Normality | 9.39 (0.000) | 5.82 (0.054) | 3.40 (0.177) | 17.35 (0.000) | 16.85 (0.000) |
| Heteroscedasticity | 0.48 (0.879) | 0.56 (0.820) | 0.69 (0.744) | 0.65 (0.705) | 0.68 (0.688) |

## 5. Conclusion and Policy Implications

The paper examined whether good trade policy enhances or hinders the effectiveness of different components of capital inflow in Nigeria. The empirical results suggest that though the individual capital inflows policy variables might have contradictory and/or negative effects (especially foreign aids) as reported in earlier studies, a well-defined aggregate index of the capital flow variables and trade openness yields positive and statistically significant effects on economic growth in Nigeria.

The positive impact of combined indices of capital flows and trade openness provides further supports the argument that a good synergy between capital inflows and trade policy could yield positive impact on economic growth in both short and long run. Capital inflow and trade openness should complement each other in boosting the technological innovation and domestic investment and therefore providing support for the modernization hypothesis. The previous studies (like Sakyi 2011) that suggest adverse effects of capital inflow even in the presence of good policy and institutional environment possibly may be suffering from either omitted variable or variable measurement error. The result from this study provides a new empirical support for the modernization hypothesis in Nigeria. This in contract to the earlier results obtained by Sakyi (2011), Roodman (2007) and Akinlo (2004) and Rajan and Subramanian (2005) which failed to establish significant positive relationship between measures of capital inflows and economic

growth. However the results conform to empirical evidence from Osinubi and Amaghionyeodiwe (2010), Khadraoui (2012), Odhiambo (2011) among others which found a positive relationship between foreign capital and economic growth. As Gomanee et al (2005) noted the capital inflow (foreign aid inclusive) should have positive impact or economic growth and the poor economic growth performance of many African countries should not be attributed to capital inflow (and or foreign aid) ineffectiveness. The likely policy implication of the findings is that capital inflows help ease the domestic resource constraint and a well-designed trade policy plays a crucial role in determining the effectiveness of capital inflow.

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# The Cost Analysis of a Start-up Company in the Information Technology Domain

**Cornelia Elena Tureac[1], Ionica Oncioiu[2]**

**Abstract:** Most countries more or less developed rely on the dynamism and resistance to risk of the private companies. Worldwide, the SMEs represent 85% of private companies that engages approximately 60% of the workforce. The company's performance is reflected in expenditure analysis which is an important factor to be considered in an enterprise. Because of the importance of this issue, we performed an analysis and the presentation of costs of a company working in the field of IT. The expenses, if they are well established and commensurate with the income, the company will certainly be able to overcome the economic barriers that occur during the course of business activity. The research methodology lies in analyzing and highlighting the company's expenses, aiming at the necessary equipment, acquisition of intangible fixed assets, administrative expenses, external services and not least the wage costs. Spending is a factor that depends entirely on the company's control, so it represents a primary factor for analysis. In conclusion the biggest expenses in the first year are those aiming at the acquisition cost of intangible fixed assets, respectively 103.090.00 representing the software necessary for conducting the activity, and those with external performance executed by third parties amounting to 330,800.00 lei, the largest share could be found in the research activity. Salary expenditures in the first year of operation are of 299.267.00 lei.

**Keywords:** enterprise; costs; acquisition

**JEL Classification:** E17; E20

## 1. Introduction

Small and medium enterprises represent the main sector of the national economy due to the high degree of mobility and flexibility, thus constituting, on segments, the most adaptable one in terms of volume and adjusting the offer to the demand volume and specifics, and not least the most important factor of labor force absorption. The number of SMEs as a whole, their distribution by size categories and activity sector, influences significantly the economic the economic performance indicators. Also, the SMEs are better adapted to modern market

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structures, as it represents a major source of innovation and economic growth, and it has a decisive contribution to increasing the competition environment in the market economy.

Most countries more or less developed, rely on the dynamism and resistance to risk of the private companies. Worldwide, the SMEs represent 85% of private companies that engages approximately 60% of the workforce. At EU level, there are nearly 21 million of SMEs representing over 98% of all enterprises. Given the role of SMEs as the main source of creation and supply of labor force, of generating over 50% of GDP for many economies, a source of revenue to the state budget, etc., it is obvious that SMEs play an essential role in any country's economic growth and development for any country.

The overall objective of the project proposed by the company is to create an added value through research and innovation in human resource performance management based on information technology domain. The project proposal is based on research and development results obtained by the company in the field of human resource performance management, based on software. The beneficiary is a start-up in information technology and the project aims at introducing a new, innovative product on the market, a result of research and development activity, i.e. the software solution, designed for every public or private organization that wishes to implement a performance evaluation platform of human resources.

The need identified in the market, to which the company wants to respond by implementing the project, is represented by the nationwide lack of complex solutions covering both the assessment and the management part of human resources performance.

The novelty of the software solution proposed by the company is mainly based on three major contributions that have no equivalent at national level:

- The combination of assessment methods and indicators based on specific algorithms.
- Module for monitoring the employee’s behavior in the use of specific computer applications, and recommendations for improvement through adequate training.
- Assessment algorithm of the effort for replacing an employee.

The expenses, if they are well established and commensurate with income, the company will certainly be able to overcome the economic barriers that occur during the course of business activity. Expenditure represents a factor that depends entirely on the company control, so it is a primary factor that needs to be taken into consideration. The analysis of expenditure is very useful as it is important for the manager to know exactly the expenses’ circuit within the company.

## 2. Research Methodology

The research methodology lies in analyzing and highlighting the company's expenses, aiming necessary equipment, acquisition of intangible fixed assets, administrative expenses, external services and not least the wage costs.

The purpose of using technological support for individual performance management is to identify and minimize the gaps in performance between strategy implementation, improvement and support of the employee's performance, and the evaluation of results in relation to the requirements and the established targets. Most software solutions designed to meet the individual performance management covers mostly the establishment, reviewing and evaluation of the employee's performance, but it also generates opportunities for their improvement.

## 3. Results

In estimating the cost elements we considered both project costs in the development period, and all of the costs during the operation period:

Costs for necessary equipment:

| | | Year 0 | | | Year 1 | | | Year 4 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. | ICT Equipment / Furniture | No pieces | Price - lei – without VAT | Value - lei - without VAT | No pieces | Price - lei – without VAT | Value - lei - without VAT | No pieces | Price - lei – without VAT | Value - lei - without VAT |
| 1 | PC | 4 | 2.100,00 | 8.400,00 | 2 | 2.000,00 | 4.000,00 | 4 | 1.800,00 | 7.200,00 |
| 2 | Multi-Function Printer | 1 | 2.000,00 | 2.000,00 | | | | 2 | 1.500,00 | 3.000,00 |
| 3 | UPS | 5 | 420,00 | 2.100,00 | 2 | 500,00 | 1.000,00 | 2 | 400,00 | 800,00 |
| 4 | Switch | 1 | 300,00 | 300,00 | | | | | | |
| 5 | Router | 1 | 300,00 | 300,00 | | | | | | |
| 6 | Server | 1 | 10.000,00 | 10.000,00 | | | | 1 | 14.000,00 | 14.000,00 |
| 7 | Projector | | | | | | | | | |
| 8 | Furniture | | | | 2 | 400,00 | 800,00 | | | |
| Total facilities in the category of fixed assets | | | | 23.100,00 | | | 5.800,00 | | | 25.000,00 |

- We took into account the purchase of two computers and two UPS in the first year of sustainability for two new employees (commercial director and financial director)

- In year 4 there is purchased a server in order to improve the commercial activities. There are also purchased another 4 computers, two UPSs and two multi-function printers in order to replace the obsolete equipment.

Costs for the acquisition of intangible fixed assets:

| | Year 0 | | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|---|---|
| Software | Quantity | Price - lei – without VAT | Total value without VAT | | | | | |
| Windows 7 Ultimate | 4 | 720,00 | 2.880,00 | | | | | |
| Windows Server 2008 R2 | 1 | 1.800,00 | 1.800,00 | | | | | |
| Office 2010 | 4 | 1.800,00 | 7.200,00 | | | | | |
| SQL Server | 1 | 3.500,00 | 3.500,00 | | | | | |
| Visual Studio With MSDN | 4 | 4.200,00 | 16.800,00 | | | | | |
| Antivirus Server + 5 client | 1 | 900,00 | 900,00 | | | | | |
| Packs with assessment tests | 25 | 550,00 | 13.750,00 | | | | | |
| Procedures and evaluation methods | 5 | 2.495,00 | 12.475,00 | | | | | |
| Performance indicators | 139 | 315,00 | 43.785,00 | | | | | |
| Total intangible assets | | | 103.090,00 | 0 | 0 | 0 | 0 | 0 |

The administrative costs during the project are:

| Implementation period - no. of months | 12 | |
|---|---|---|
| Expenditures | Month | Total period |
| Telecommunications + Internet | 350 | 4.200 |
| Electric power | 250 | 3.000 |
| Water | 75 | 900 |
| Sewerage | 75 | 900 |
| Sanitation | 50 | 600 |
| Space for rent | 6250 | 75.000 |
| TOTAL | | 84.600 |

During the sustainability period the costs are estimated as follows:

| Administrative expenditures | Year 0 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|
| Growth index | | 3,0% | 3,0% | 3,0% | 3,0% | 3% |
| Telecommunication | 4.200 | 4.236 | 4.456 | 4.589 | 4.727 | 4.869 |
| Rent + Maintenance | 80.400 | 82.812 | 85.296 | 87.855 | 90.491 | 93.206 |
| TOTAL | 84.600 | 87.138 | 89.752 | 92.445 | 95.218 | 98.075 |

Based on the statistics made by the specialized institutions for the period 2009 - 2013, it was considered an index average of annual growth of 3% of the administrative expenditures.

Company's costs with external services

| External Services | Year 0 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|
| Research services | 232.800,00 | | | | | |
| Innovation Consulting Services | 5.000,00 | | | | | |
| Innovation Support Services | 40.000,00 | | | | | |
| Publications and subscriptions | - | | | | | |
| Marketing and advertising expenses on the project | 45.000,00 | 29.466 | 34.099 | 38.732 | 43.366 | 47.999 |
| Financial audit (ineligible expenditure) | 3.500,00 | | | | | |
| Security Audit (ineligible expenditure) | 4.500,00 | | | | | |
| Total external services | 330.800,00 | 29.466 | 34.099 | 38.732 | 43.366 | 47.999 |

In years 1-5 of operation there will be invested in promotion and marketing 5% per year from the achieved revenues.

| Job | No Of people | Net Salary - Lei | Gross Salary -Lei | Total gross salaries | Taxes | Monthly Cost of salary/Job | Total gross salaries | Taxes | Total cost of salary - Lei- |
|---|---|---|---|---|---|---|---|---|---|
| Solutions Architect | 1 | 4.800 | 6.840 | 6.840 | 1.984 | 8.824 | 75.240 | 21.820 | 97.060 |
| Tester | 1 | 3.750 | 5.344 | 5.344 | 1.550 | 6.893 | 42.750 | 12.398 | 55.148 |
| Programmers (Software Development) | 1 | 4.000 | 5.700 | 5.700 | 1.653 | 7.353 | 57.000 | 16.530 | 73.530 |
| Programmers (Software Development) | 1 | 4.000 | 5.700 | 5.700 | 1.653 | 7.353 | 57.000 | 16.530 | 73.530 |
| Total | 4 | | 23.584 | 23.584 | 6.839 | 30.423 | 231.990 | 67.277 | 299.267 |

Salary costs in the first year of operation:

| Job | No Of people | Net Salary -Lei | Gross Salary -Lei | Total gross salaries | Taxes | Monthly Cost of salary/Job | Total gross salaries | Taxes | Total cost of salary - Lei- |
|---|---|---|---|---|---|---|---|---|---|
| Solutions Architect | 1 | 4.920 | 7.011 | 7.011 | 2.033 | 9.044 | 84.132 | 24.398 | 108.530 |
| Tester | 1 | 3.844 | 5.477 | 5.477 | 1.588 | 7.066 | 65.728 | 19.061 | 84.789 |
| Programmers (Software Development) | 1 | 4.100 | 5.843 | 5.843 | 1.694 | 7.537 | 70.110 | 20.332 | 90.442 |
| Programmers (Software Development) | 1 | 4.100 | 5.843 | 5.843 | 1.694 | 7.537 | 70.110 | 20.332 | 90.442 |
| Financial Director | 1 | 645 | 919 | 919 | 267 | 1.186 | 11.030 | 3.199 | 14.228 |
| Commercial Director | 1 | 2.150 | 3.064 | 3.064 | 888 | 3.952 | 24.510 | 7.108 | 31.618 |
| Total | 6 | | | 28.156 | 8.165 | 36.322 | 325.620 | 94.430 | 420.049 |

In the first year of operation, there are employed 2 new colleagues: a Commercial Director and a Financial Director. The Commercial Director was hired from the 5$^{th}$ month (May). The salaries of the new colleagues are highlighted in the table above.

In the first year there will not be achieved any pay rises to the existing employees.

During the operation period, the wages will increase by 5% in year 2 and with 10% in year 3, 4 and 5. There were taken into account also the possibility of new jobs in the years of operation, if the conducted activity will require.

| | Operation | | | | | |
|---|---|---|---|---|---|---|
| Expenditure on Staff | Year 0 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| The rate of the increase in salaries | | | 5,00% | 10,00% | 10,00% | 10,00% |
| Cost salary | 299.267 | 420.049 | 457.651 | 503.416 | 553.758 | 609.134 |
| Gross wages | 231.990 | 325.620 | 354.768 | 390.245 | 429.270 | 472.197 |
| Taxes on salary | 67.277 | 94.430 | 102.883 | 113.171 | 124.488 | 136.937 |

## 4. Conclusions

Small and medium enterprises represent the main sector of the national economy due to the high degree of mobility and flexibility, thus constituting, on segments, the most adaptable one in terms of volume and adjusting the offer to the demand volume and specifics, and not least the most important factor of labor force absorption. The number of SMEs as a whole, their distribution by size categories and activity sector, influences significantly the economic the economic performance indicators. Also, the SMEs are better adapted to modern market structures, as it represents a major source of innovation and economic growth, and it has a decisive contribution to increasing the competition environment in the market economy.

At EU level, there are nearly 21 million of SMEs representing over 98% of all enterprises. Given the role of SMEs as the main source of creation and supply of labor force, of generating over 50% of GDP for many economies, a source of revenue to the state budget, etc., it is obvious that SMEs play an essential role in any country's economic growth and development for any country.

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In conclusion the biggest expenses in the first year are those regarding the acquisition cost of intangible fixed assets, respectively 103,090.00 lei representing the software required for conducting the activity, and those with external services executed by the third parties of 330,800.00 lei, the biggest share could be found in the research activity. The salary expenditures in the first year of operation are of 299,267.00 lei.

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