



FACULTY OF FINANCE AND BANKING (FABBV)  
Bucharest University of Economic Studies

SIF BANAT-CRIȘANA

EximBank Romania

ASOCIAȚIA ROMÂNĂ DE FINANȚE-BĂNCI – RoFIBA  
(Romanian Association of Finance and Banking – RoFIBA)

Finance Doctoral School

CENTRUL DE CERCETĂRI FINANCIAR-MONETARE – CEFIMO  
(Centre of Financial and Monetary Research – CEFIMO)

# International Finance and Banking Conference

## FI BA 2018

### (XVI<sup>th</sup> Edition)

March 29-30, 2018  
Bucharest, Romania  
[www.fabbv.ase.ro](http://www.fabbv.ase.ro)

## Scientific Committee

Professor Gabriela ANGHELACHE, PhD – Faculty of Finance and Banking, Bucharest University of Economic Studies

Professor Dumitru BADEA, PhD – Faculty of Finance and Banking, Bucharest University of Economic Studies

Professor Emilia CAMPEANU, PhD – Vice-Dean of Faculty of Finance and Banking, Bucharest University of Economic Studies

Professor Victor DRAGOTA, PhD – Faculty of Finance and Banking, Bucharest University of Economic Studies

Professor Dalina DUMITRESCU, PhD – Vice-Rector of the Bucharest University of Economic Studies, Faculty of Finance and Banking

Professor Nicolae ISTUDOR, PhD – Rector of Bucharest University of Economic Studies

Professor Alexandru MINEA, PhD – Universitatea d'Auvergne

Professor Ciprian NECULA, PhD – Faculty of Finance and Banking, Bucharest University of Economic Studies

Professor Bogdan NEGREA, PhD – Faculty of Finance and Banking, Bucharest University of Economic Studies

Professor Dorel Mihai PARASCHIV, PhD – Vice-rector of Bucharest University of Economic Studies

Professor Gheorghe RUXANDA, PhD – Faculty of Economic Cybernetics, Statistics and Informatics, Bucharest University of Economic Studies

Professor Ion STANCU, PhD – Faculty of Finance and Banking, Bucharest University of Economic Studies

Professor Andreea STOIAN, PhD – Faculty of Finance and Banking, Bucharest University of Economic Studies

Professor Georgeta VINTILA, PhD – Director of the Finance Doctoral School, Faculty of Finance and Banking, Bucharest University of Economic Studies

Professor Paul WACHTEL, PhD – New York University

Associate Professor Florina Cristina BADARAU, PhD – University of Bordeaux

Associate professor Alberto BAGNAI, PhD – University of Pescara

Associate Professor Iustina BOITAN, PhD – Vice-Dean of Faculty of Finance and Banking, Bucharest University of Economic Studies

Associate Professor Lucian TATU, PhD – Head of Department of Finance Faculty of Finance and Banking, Bucharest University of Economic Studies

Assistant Professor Pedro CERQUEIRA, PhD – University of Coimbra

Associate Professor Ionela COSTICA, PhD – Dean of Faculty of Finance and Banking, Bucharest University of Economic Studies

Associate Professor Georgiana CRETAN, PhD – Faculty of Finance and Banking, Bucharest University of Economic Studies

Associate Professor Rodica GHERGHINA, PhD – Faculty of Finance and Banking, Bucharest University of Economic Studies

Associate Professor Paul TANASESCU, PhD – Faculty of Finance and Banking, Bucharest University of Economic Studies

Associate Professor Camelia TURCU, PhD – University of Orléans

Lecturer David DUFFY, PhD – University of Ulster

Lecturer Dan Costin NITESCU, PhD – Faculty of Finance and Banking, Bucharest University of Economic Studies

Dr. Christian OBERST, PhD – University of Aachen

## Organization Committee

Bogdan Alexandru DRAGOI – Chairman & CEO, SIF Banat – Crisana, Romania

Professor Ion STANCU, PhD – Faculty of Finance and Banking, Bucharest University of Economic Studies

Professor Emilia CÂMPEANU, PhD – Vice–Dean of Faculty of Finance and Banking, Bucharest University of Economic Studies

Professor Dalina DUMITRESCU, PhD – Vice-Rector of Bucharest University of Economic Studies, Faculty of Finance and Banking

Professor Andreea STOIAN, PhD – Head of Center of Financial and Monetary Research (CEFIMO), Faculty of Finance and Banking, Bucharest University of Economic Studies

Associate Professor Ionela COSTICA, PhD – Dean of Faculty of Finance and Banking, Bucharest University of Economic Studies

Associate Professor Iustina BOITAN, PhD – Vice–Dean of Faculty of Finance and Banking, Bucharest University of Economic Studies

Associate Professor Rodica GHERGHINA, PhD – Faculty of Finance and Banking, Bucharest University of Economic Studies

Lecturer Radu CIOBANU, PhD – Faculty of Finance and Banking, Bucharest University of Economic Studies

Assistant Professor Liliana SIMIONESCU, PhD – Faculty of Finance and Banking, Bucharest University of Economic Studies

## Contents

### **Review of effects of economic reforms on economic development countries in transition**

- *Jelena TOSKOVIC, Jovana KISIN / 7*

### **Iceland and its participation in European economic integration: advantages and disadvantages of European Union and Euro Area membership**

- *Hilmar Þór HILMARSSON / 15*

### **The role of fiscal policies in maintaining macroeconomic stability. A DSGE model approach**

- *George PASMANGIU / 31*

### **A new approach to corporate governance**

- *Andrei STĂNCULESCU / 45*

### **Bancassurance – one of the most important distribution channel in Europe**

- *Elda MARZAI (ABLIZ) / 49*

### **Comparative assessment of risk-based capital, Solvency II and Swiss solvency test**

- *Aurora Elena DINA (MANOLACHE) / 61*

### **Redesigning optimal mechanisms in social assistance**

- *Cosmin ȘERBĂNESCU, Adrian VINTILESCU, Lăcrămioara CORCHEȘ / 73*

### **How do unemployment benefits and minimum wage affect poverty?**

- *Cristina Irina PARASCHIV / 91*

### **The economic impact of indirect taxes on economic growth in European context**

- *Cosmina-Ștefania CHIRICU / 113*

### **The impact of public health and education expenditure on income inequality in European Union**

- *Ionuț JIANU / 121*

### **Determinants of fiscal discipline on Romania - the IMF and the EU**

- *Sandina Maria JELOAICA / 135*

**Impact of the volatility of Indian oil prices on sectoral returns in Indian equity markets**

- *Rinku JAIN, Kirti AREKAR, Aayesha TAHERAH / 147*

**Evolution of the main macroeconomic indicators as a result of Romania's integration into the EU**

- *Ana-Maria URÎTESCU / 163*

**A direct measurement of corporate financial constraints of SMEs and large firms in Mauritius.****A firm level survey analysis**

- *Chakeel PRAYAGSING, Kheswar JANKEE / 175*

**Political connection and allocation of capital in the corporate sector in Mauritius.****A game approach (theoretical relationship)**

- *Chakeel PRAYAGSING, Kheswar JANKEE / 197*

**A game of bank resolution**

- *Gabriel MITRACHE / 209*

# Review of effects of economic reforms on economic development of the countries in transition

**Jelena TOSKOVIC**

Mlekara Šabac A.D. in Šabac, Serbia  
toskovicjelena@yahoo.com

**Jovana KISIN**

Faculty of Business Economy (Educons University) in Novi Sad, Serbia  
jovanna.adzic@gmail.com

**Abstract.** *Countries in transition are economies that are changing from a centrally planned organized to the countries of the free market. The essence of this process is the implementation of economic liberalization in which market forces influencing the prices formation, reduction of trade barriers to the abolition, privatization of state enterprises and resources, and the creation of financial sector which should facilitate the movement of private capital.*

*Due to the inefficiency of the system, at the end of twentieth century socialism as a social system and economic model ceased to be an alternative to the capitalist economic model. Although official statistics showed growth of economic activities which used to exceeded the growth rates of developed market economies, it was not the growth that creates new value.*

*This research work deals with the review of the effects of systemic economic reforms in countries in transition. The analysis of nine transition indicators, prescribed by EBRD, the existence of differences between the two groups of countries in transition was explored, that are formed on the basis of the average value of the transition indicators, in terms of the value of GDP.*

*Using the Mann-Whitney U test statistical methods, it is found that countries in transition that have higher value of the average transition indicator recorded a higher value of GDP. Also, based on the results we could see which countries have the best progress in the transition process in the respective calendar year.*

**Keywords:** economic reforms; systemic reforms; Mann-Whitney U test; transition countries; EBRD.

**JEL Classification:** E10; O11; P20.

## 1. Introduction

The eighties, the countries of centrally planned economy, which are called countries in transition, have begun to implement economic and systemic reforms in order to have started market-oriented economy. The cause of reform is primarily associated with the abandonment of the socialist regime which is implemented in these countries and the transition to the new capitalist regime. Also the cause of reform were macroeconomic imbalances, the mismatch between supply and demand, the trade deficit, as well as the high external debts that did not promise the basis for transformation in most socialist economies (Holscher, 2009).

These countries having switched to a market system adopted new market rules and pledge to respect and implementation of market reforms that have entailed the privatization and deregulation of economic activities, the liberalization of financial flows, and the gradual reduction of state economic functions (Filipovic, 2014).

In order to change economic structure into market based economy, countries in transition should have external sources, which were backed by international financial institutions, the IMF and the World Bank which supported the economic reforms' systems.

The reform process in the transition countries radically took place, assuming the implementation of the dominant neoliberal concept, which is based on the ideas of the liberal concept founded by Adam Smith, and who is supported by Friedman, Hayek and other authors. The direction advocated the reduction of state influence and tough measures of fiscal austerity (Filipovic, Miljkovic, 2014), as well as the free flow of capital, goods and services that would lead to economic growth (Ljubojevic, 2012).

Neo-liberal concept has primarily been accepted by the United Kingdom and the United States, its implementation in countries in transition occurred in the nineties of the twentieth century, when J. Williamson defined the ten recommendations of the transition process, which is called economic stabilization program (Williamson, 1990):

- establishing fiscal discipline;
- redirection of public expenditure (health, education, infrastructure);
- Tax reform (broadening the tax base with moderate tax rates) competitive exchange rate;
- protection of property rights;
- market deregulation;
- liberalization of interest rates;
- privatization of public enterprises,
- encouraging foreign direct investment and
- liberalisation of foreign trade.

After the first phase of economic-system reforms, large market failure was noticed that initiated the expansion of recommendations, which were related to the fight against corruption, the introduction of labor market flexibility, modifying the social security system, the definition of poverty reduction measures, redefining standards of financial and other (Williamson, 2004).

In 2007, the emergence of the global economic crisis in the United States, transition countries found themselves in the midst of falling growth rates, increased foreign indebtedness and the fall in capital inflows, which raised the issue of the correctness of the economic and systemic reforms in these countries. This led to the dilemma whether developed economies impose the free market as the standard of the weaker players in the international market, while the powerful economies behave in accordance with their current interests (Josifidis, 2004).



## 2. Literature Review

Many authors have dealt with the relation between market reforms and economic growth in their academic papers. Svejnar noted that the process of transition from centrally planned to market economy in these countries was a difficult (Svejnar, 2002), due to the implementation of two models of reform, which refer to "shock therapy" and gradualist approach.

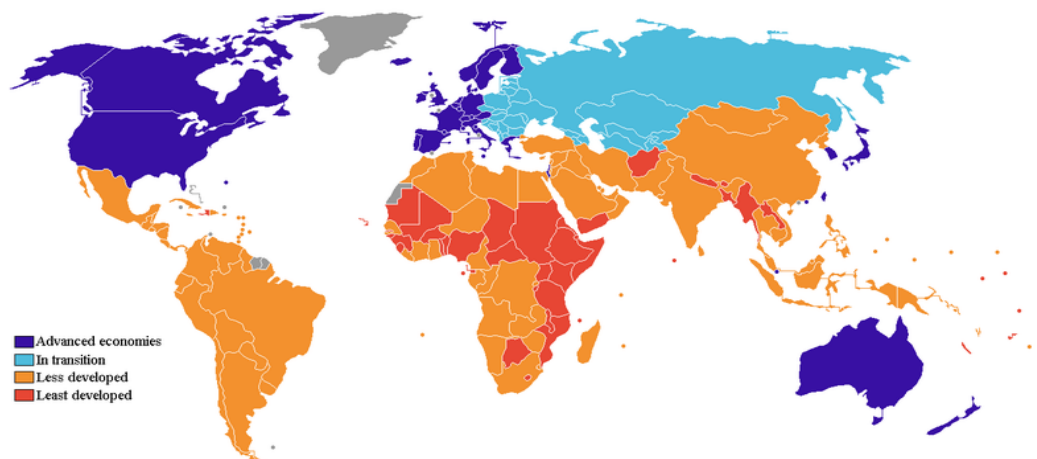
First, most countries adopted the model of "shock therapy", which is aimed at the implementation of the privatization program (making 50% of GDP over the private sector and employment 2/3 of the workforce in the same) and the liberalization of foreign trade and financial flows (Kovacevic, 2011), which were completed by the end of the nineties. In contrast, Lin considered that the transition in these countries led to a dramatic fall in their economies and deterioration in many aspects of the social environment (Lin, 2009).

After the first phase, it became clear that the results are not satisfactory, and approached the second stage of transition reforms which acceded and other countries, and which was based on the so-called "Gradualist approach". This phase occurred in late 1990, and initiated the building of institutions, and establishing the balance of the state and the market, which referred to the construction-oriented legal system, institutions, labor market regulations and more.

At first, the effects of reforms were modest in economic growth, however, experiment showed that countries that are more effective implementation of the reforms and institutional build, quickly achieved economic growth rates (IMF, 2014).

The global economic crisis that began in 2007 in the United States produced a number of serious economic and social consequences such as a reduction of GDP, an increase in unemployment, lowering the value of trade of products and services, reduction of FDI and more difficult to obtain credit abroad, which led to falling into the debt crisis of a number of countries (Kovacevic, 2009). Holcher believed that after twenty years of economic transition, the rate of growth in transition countries would remain modest (Holcher, 2009). The following picture 1 illustrates the status of economic development of the world countries.

**Picture 1.** *Economic development in the World countries*



**Source:**

[http://predmet.singidunum.ac.rs/pluginfile.php/3258/mod\\_folder/content/1/TRANZICIJA.ppt?forcedownload=1](http://predmet.singidunum.ac.rs/pluginfile.php/3258/mod_folder/content/1/TRANZICIJA.ppt?forcedownload=1)

## 3. Economic-system reforms

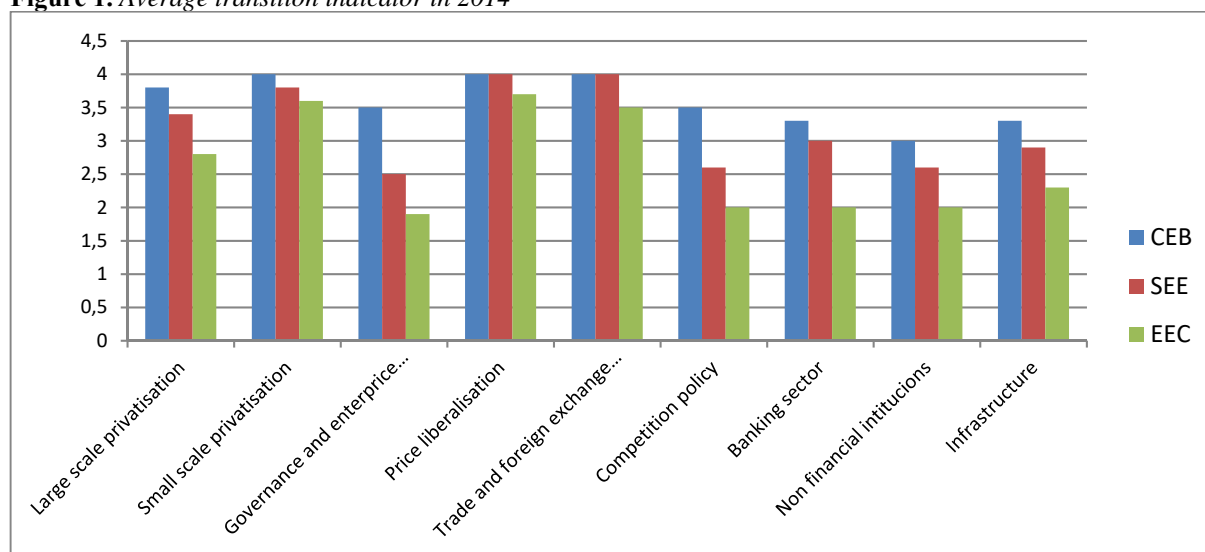
According to EBRD methodology developed in 1994 the measuring progress in the implementation of transitional reforms implies a quantitative evaluation process implemented reforms with the specified criteria. The scale of indicators ranges from 1 to 4+, where 1

represents little or no change from the rigid centrally planned economy, while score 4+ represents the standards of developed market economies. In its annual Transition Report, the EBRD monitors progress in the implementation of economic-system reforms and quantitatively assesses the progress on the basis of nine transition indicators, which relate to:

- Large scale privatization,
- Small scale privatization,
- Governance and enterprise restructuring,
- Price liberalization,
- Trade and forex system,
- Competition policy,
- Banking sector,
- Non- banking institutions,
- Infrastructure.

Transitions countries consists of 35 countries that are divided by location on Central Europe and the Baltics (CEB)<sup>(1)</sup>, South-Eastern Europe (SEE)<sup>(2)</sup>, Eastern Europe and the Caucasus (EEC)<sup>(3)</sup>. So that makes a total sample of 30 countries that were analyzed in 2014<sup>(4)</sup>. The highest overall average transition indicator was recorded by the country CEB 3.6, then 3.2 SEE countries, while the smallest progress in the country recorded EEC 2.6. Observing each transition indicator greatest success in the implementation of the Price liberalization indicator recorded 3.9, while the smallest success in reforms had Non-banking institutions indicator 2.5 (Figure 1).

**Figure 1.** Average transition indicator in 2014



**Source:** Authors based on EBRD

Over 1.8 billion people from Central Europe to East Asia are involved in the process of systemic transformation. The tendency of the development of GDP in the countries at least in a qualitative sense corresponds to what was expected at the beginning of the transition. In the beginning there was a sharp decline, but soon after that rapid recovery and sustainable growth were achieved.

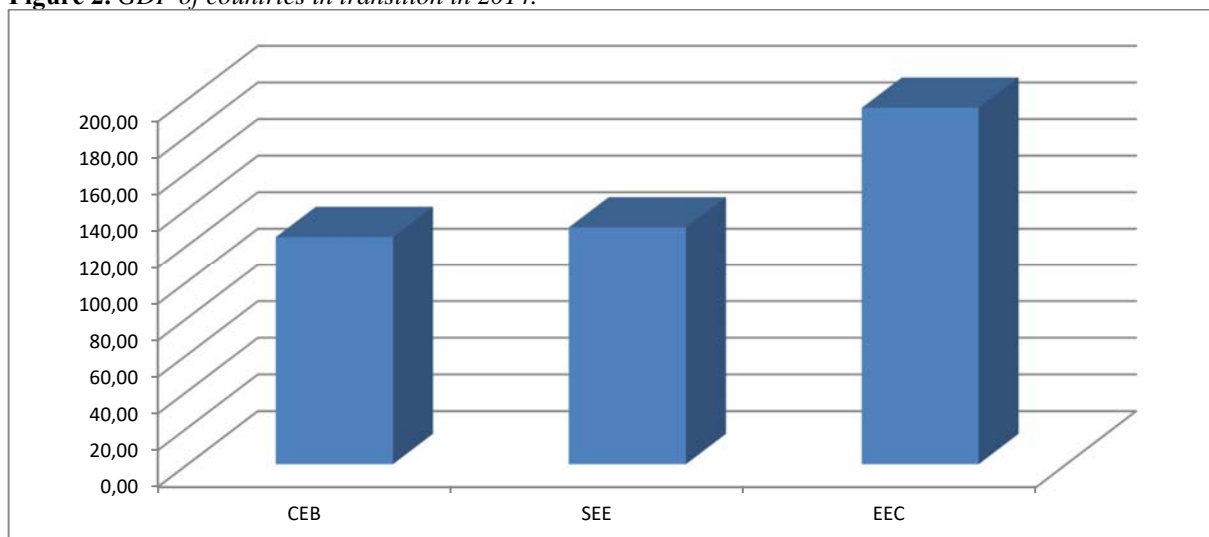
The division of economic systems, structural change, reorientation of the economy from a planned to a market economy, the big political fractures, are reflected in the economic growth of countries in transition. Economic trends in the world cause shakes and deep social changes in the national economy, especially in small economic systems.

The transition process has many negative consequences that struck a large number of countries. In the first place there is a dramatic drop in industrial production and the collapse of

giant enterprises, weak GDP growth and standard of living, increase of unemployment and the impoverishment of the majority of the population, a weak flow of capital and investments, and the exodus of young skilled people to developed countries with high standards. Gross domestic product is one of the basic macroeconomic indicators that represent the total production of goods and services, achieved in the national economy during the year, expressed in monetary units. As a criterion of economic activity of a country, the most commonly used macroeconomic aggregate within the system of national accounts, which is a measure of the final production. Data on the amount and growth rates of gross domestic product and production in the observed countries indicate the situation and developments in the economy.

Values of GDP of the group of transition countries in 2014 are taken as an indicator that analyzes the effects of transition indicators. Eastern Europe and the Caucasus (EEC) achieved the highest GDP in the amount of 195.15 billion dollars in 2014, while SEE countries achieved 129.8 billion, and the country CEB 124.5 billion dollars. Group of countries of Central Europe and the Baltic (CEB) and South-Eastern Europe (SEE) have GDP at about the same level in 2014 (Figure 2).

**Figure 2.** *GDP of countries in transition in 2014.*



**Source:** Authors based on World Bank

The GDP of countries in transition in 2014 could not be higher due to slowdown of Chinese, Brazilian and partly the Indian economy, due to the highlighted debt crisis of the US and still difficult situation in Europe, which only recovered from the recession, but remained burdened by high unemployment and enormous debt of some European countries. Economic growth in the US economy is still low, while Japan was under the pressure of deflation.

The economies of most countries globally are still faced with constraints and structural problems that are slowing down the growth of investment and prevent faster growth in productivity. Attempts of the policy of austerity to influence on growth strategies have not yielded the expected results, causing growing social uprising.

#### 4. Methodology and data

In this paper, an analysis was carried out in 30 countries in transition, while the period covered by the survey research 2014. year. For analysis of GDP and the average transition indicator in this paper the Mann-Whitney U test was used for the comparison group. The main purpose of this research is to determine whether there is a statistically significant difference between the two groups of transition countries, grouped by the value of the average transition

indicator in 2014, as to the value of GDP. The basic idea was to determine whether the transitional countries that have higher value of the average transition indicator, also recorded a higher value of GDP.

The Mann-Whitney U test, also referred to as the Wilcoxon rank-sum test, tests whether two independent samples have been drawn from two populations that have the same relative frequency distribution. This test directly considers the rankings of the observations in each sample (Lee, 2013). In this research the difference between the two groups of countries was examined, depending on the value of GDP.

The analysis included 30 countries in transition which are divided into two groups (Table 1) for the Mann-Whitney U test, depending on whether they have value the average transition indicator in 2014 is greater, or less than 3.10.

**Table 1.** Two groups of transition countries according to the average transition indicator and GDP (2014)

Average transition indicator $\leq 3.10$			GDP (BIL. US \$)
1.	Albania	3.06	13.21
2.	Bosnia and Herzegovina	2.83	18.29
3.	Montenegro	3.06	4.59
4.	Serbia	3.08	43.87
5.	Armenia	2.94	11.64
6.	Azerbaijan	2.67	75.20
7.	Belarus	2.08	76.14
8.	Moldova	2.83	7.96
9.	Ukraine	2.94	131.81
10.	Kazakhstan	2.92	217.87
11.	Kyrgyz Rep	2.86	7.40
12.	Mongolia	3.00	12.02
13.	Tajikistan	2.64	9.24
14.	Turkmenist	1.56	47.93
15.	Uzbekistan	2.22	62.64
Average transition indicator $> 3.11$			GDP (BIL. US \$)
1.	Croatia	3.44	57.11
2.	Estonia	3.83	26.49
3.	Hungary	3.61	138.35
4.	Latvia	3.61	31.29
5.	Lithuania	3.61	48.35
6.	Poland	3.89	544.97
7.	Slovak Rep	3.67	100.25
8.	Slovenia	3.33	49.49
9.	Bulgaria	3.44	56.72
10.	Cyprus	3.63	23.23
11.	Macedonia	3.31	11.32
12.	Romania	3.47	199.04
13.	Turkey	3.33	798.43
14.	Georgia	3.11	16.53
15.	Russia	3.14	1860.60

Source: Own calculations, World Bank (2014)

## 5. Estimation Results

The main purpose of these investigations is to determine whether there is a statistically significant difference between the two defined groups of transition economies in terms of GDP in 2014. The results of this test are shown in Table 2.

**Table 2.** Mann-Whitney U test

	Mann-Whitney	Z	p
GDP	64	-2.012	0.044

Source: Authors

The value in this test is -2012, with a significance level of  $p = 0.044$ . Since the  $p < 0.05$  result of the research shows that there is a statistically significant difference in values of GDP between the two groups.

To confirm the initial assumption that the transitional countries that have higher value of the average transition indicator recorded a higher value of GDP has been shown in which the group has analyzed more variable. On the basis of the median (which divides the sample in half, i.e. Upper and lower half) of each group (Table 3), it can be confirmed that the transition countries that have made more progress in the transition process, record and greater value of GDP.

**Table 3.** *Median analyzed groups*

Groups	Number of countries	Median
Group 1 (Average transition indicator $\leq 3.10$ )	15	18.29
Group 2 (Average transition indicator $> 3.11$ )	15	56.71

Source: Authors

Empirical research has shown that those countries have made more progress in the process of implementing transitional reforms at the same time more felt negative effects of the crisis measured by the rate of GDP growth. (Toskovic, Filipovic, 2017). By implementing transitional reforms in the spirit of the neoliberal concept of the economy, the country in the the transition to liberalization, deregulation and thus more include in international capital flows.

## 6. Conclusions

In an unpredictable business environment survive only economic systems that are able to successfully manage change and constantly reforming. The transition process has the broadest global dimension and includes training for the global economy, private property, market economy, liberal, democratic civil society, political pluralism and the rule of law, all based on strong and effective democratic institutions.

The eighties, the countries of centrally planned economy, have begun to implement economic and systemic reforms in order to have started market-oriented economy. Also the causes of reform were macroeconomic imbalances, the trade deficit, as well as the high external debts that did not promise the basis for transformation in most socialist economies. The process of transition reforms primarily was accepted by the international financial institutions, which were the main driving force and an accessory to the reforms. Initiated changes in the field of economics, although under the influence of many factors have amortized effect, took on the character of irreversible processes.

The results of the transition and the effects of the reforms, there is a difference in the productivity of labour and capital at the beginning of the transition and dwindling differences between the old and new sectors during reform provides true definition of the end of the transition. Also, differences in progress are visible between countries that have implemented different models of the transition process, but there are differences in the effectiveness of reform implementation in various segments of the economic system.

As the task of this paper is to examine the effect of applying systemic economic reforms in countries in transition, analysis of nine transition indicators, prescribed by the EBRD, it is explored the existence of differences between the two groups of countries in transition. There are identified differences by research, formed on the basis of the average value of the transition indicators, in terms of the value of GDP.

Transition countries are divided into two groups depending on whether they value the average transition indicator in 2014 is greater, or less than 3.4. Using the Mann-Whitney U test

statistical methods, it is found that the transition countries that have higher value of the average transition indicator recorded a higher value of GDP. Also, based on the results we have insight into that the second group countries make better progress in the transition process in the referent year.

By the obtained results objectives are fully realized, significance and the original scientific contribution of this research are confirmed. By analyzing the transition indicators it was found that this method can be applied to similar studies, with future adjustments and improvements data processing methodologies, all with the aim of obtaining more precise results.

---

## Notes

- (1) Central Europe and the Baltics (CEB) countries are Croatia, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia.
- (2) South-Eastern Europe (SEE) countries are Albania, Bosnia and Herzegovina, Bulgaria, Cyprus, Macedonia, Montenegro, Romania, Serbia, Turkey.
- (3) Eastern Europe and the Caucasus (EEC) countries are Armenia, Azerbaijan, Belarus, Georgia, Moldova, Ukraine, Russia, Kazakhstan, Kyrgyz Republic, Mongolia, Tajikistan, Turkmenistan, Uzbekistan.
- (4) Data for all indicators other than the reform of the banking sector, the reform of non-banking financial institutions and infrastructure reform for 2015 and 2016 are not published in the EBRD's annual report.

---

## References

- Filipovic, S., 2014. *Revisiting the neoliberal concept in the Western Balkans*, Conference with international participation, Great Recession and crisis of neoliberal economics, S. Kamenica, 2014, str. 125-143.
- Filipovic, S. and Miljkovic, M., 2014. Transition Economies during Global Economic Crisis: A Difference in Differences Approach, *Industrija Journal of sustainable economics*, Vol. 42, No. 3, pp. 23-41.
- Holcher, J., 2009. Twenty years of economic transition: Success and Failures, *The Journal of comparative economic studies*, Vol. 5, pp. 3-17.
- International Monetary Fund–IMF, 2014. *25 Years of Transition Post-Communist Europe and the IMF*, <[http://www.imf.org/external/pubs/ft/reo/2014/eur/eng/pdf/erei\\_sr\\_102414.pdf](http://www.imf.org/external/pubs/ft/reo/2014/eur/eng/pdf/erei_sr_102414.pdf)>
- Josifidis, K., 2004. *Neoliberalism-fate or choice of lifestyle (s) in transition*, <<http://www.ff.uns.ac.rs/stara/elpub/susretkultura/6.pdf>>
- Kovacevic, M., 2009. *Causes and consequences of the global economic crisis and effects on Serbia*, Economic Policy <<http://www.nspm.rs/ekonomska-politika/uzroci-i-posledice-svetske-ekonomske-krize-i-efekti-na-srbiju.html?alphabet=1>>
- Kovacevic, M., 2011. *Dimensions and causes of the unsuccessful transition of the countries of the Western Balkans, especially Serbia*, Balkan magazine <<http://www.balkanmagazin.net/nauka/cid144-17949/dimenzije-i-uzroci-neuspesne-tranzicije-zemalja-zapadnog-balkana-a-posebno-srbije-2>>
- Lee, C.F., Lee, J.C. and Lee, A.C., 2013. *Statistics for Business and Financial Economics*, Springer.
- Lin, J., 2009. *Economic Development and Transition: Thought, Strategy and Viability*, Cambridge University Press, Cambridge, UK.
- Ljubojevic, M., 2012. *The increase in poverty, transition and globalization*, Fond Slobodan Jovanovic.
- Svejnar, J., 2002. Transition economies: Performance and challenges, *The Journal of Economic Perspectives*, Vol. 16, pp. 3-28.
- Toskovic, J. and Filipovic, S., 2017. *Neoliberal concept of the economy in the countries of the Western Balkans*, Monograph, Economic Institute, Belgrade.
- Williamson, J., 1990. *What Washington means by policy reform, Latin American Adjustment. How much has happened?*, Washington, Institute for International Economics.
- Williamson, J., 2004. *A Short History of the Washington Consensus*, CIDOB, Barcelona.

# Iceland and its participation in European economic integration: advantages and disadvantages of European Union and Euro Area membership

**Dr. Hilmar Þór HILMARSSON**

Professor, School of Business and Science,  
University of Akureyri, Iceland.  
hilmar@unak.is

**Abstract.** *Iceland is a member of the European Free Trade Association, the European Economic Area and Schengen. It was a European Union candidate country until recently, when its government decided to withdraw its European Union membership application. The European Economic Area agreement currently ensures Iceland's access to the European Union's common market. The question remains what is the most feasible arrangement for long term prosperity of Iceland? Should it continue to rely on the current arrangement? Should it seek European Union membership in the future and perhaps subsequently become part of the Euro Area? What are the possible advantages and disadvantages for Iceland joining the European Union and the Euro Area? These questions have economic, political as well as security dimensions. According to the article EFTA membership and the EEA agreement appear to be the best arrangement for Iceland at present. The EEA agreement decision shaping under the two-pillar structure of EEA EFTA bodies that match those on the EU side has so far served well. The three EEA countries have some modest influence under this system and this arrangement ensures access to the internal EU market. This can change in the medium or long-term and the decision made by the government of Iceland that Iceland should not be considered a candidate or potential EU candidate country may have been short sighted. Iceland should not make any decisions that cannot be reversed given how quickly the global environment can change.*

**Keywords:** economic integration, small states, Iceland, global crisis, economic policy.

**JEL Classification:** F15, H12, E6.

## Introduction

Iceland is a member of European Free Trade Area (EFTA), The European Economic Area (EEA) and Schengen. Iceland applied for a European Union (EU) membership in July 2009 and began accession negotiations a year later. The cabinet, that took office in May 2013 decided to put the accession negotiations on hold, dissolve the negotiating structures, and to commission an assessment of the accession process as well as of developments in the EU (Ministry for Foreign Affairs, 2015). When the accession negotiations were put on hold 27 out of 33 chapters had been opened, out of which 11 have been provisionally closed. 6 chapters had not been opened, although negotiating positions was in place for two of them, i.e. the chapter on food safety, veterinary and phytosanitary policy and the chapter on justice, freedom and security. A negotiating position was not in place for four chapters, i.e. the chapters on agriculture, on fisheries, on the free movement of capital and on the right of establishment and freedom to provide services (Institute of Economic Studies at the University of Iceland, 2014).

Had negotiations resumed, Iceland would have faced contentious issues on fisheries policy which could have derailed an agreement. The chapter on agriculture was also sensitive and challenging. Since those most difficult chapters were never opened it is hard to say what the changes of agreement between Iceland and the EU were. Also, if an agreement was reached, the accession treaty would still require ratification by every EU state and be subject to a national referendum in Iceland. Public support for European Union accession measured by opinion polls has fluctuated but is currently low. The new cabinet<sup>(1)</sup> took office in November 2017 does not intend to reapply for European Union membership.

The research problem of the article is to answer the following question: What are the possible advantages and disadvantages for Iceland joining the EU and the Euro Area? This question has economic dimensions such as continued access to the European Union common market and the advantages and disadvantages of adopting a common currency in the future. There are also political dimensions such as Iceland's ability to influence EU's future regulations and legislation. Finally, there are security question. Iceland is an NATO member state and it could be argued that European Union as well as Euro Area membership would provide additional security. There are costs and benefits associated with all those issues, but the focus of this article is mainly on the economic and political dimensions.

## Iceland's European Integration: History and Some Theoretical Considerations

Classical economic theory documents gain from international trade, demonstrating that nations can improve the welfare of their populations by engaging in cross-border trade with other nations. To this day this is one of the fundamental principles underlying arguments for all countries to strive to expand and to promote free world trade (e.g. Czinkota et al., 2009). The efficiencies derived from economics of scale are also a key argument for economic integration<sup>(2)</sup> and the creation of a common market that can benefit all participating countries. The level of economic integration varies. From least to most integrative, they are: the free trade area, the customs union, the common market and finally the economic union. The European Free Trade Association which Iceland is a member of since 1970 (see Table 1), is a free trade area and represents the loosest form of economic integration where all barriers to trade among member countries are removed.



**Table 1.** *European Free Trade Association (EFTA)<sup>(3)</sup> membership through the years*

1960	Austria, Denmark, Norway, Portugal, Sweden, Switzerland and the United Kingdom establish EFTA
1970	<i>Iceland becomes a member of EFTA</i>
1972	Denmark and the United Kingdom leave EFTA to join the European Economic Community (EEC)
1985	Portugal leaves EFTA to become a member of the European Economic Community (EEC)
1986	Finland becomes a full member of EFTA
1991	Liechtenstein becomes a member of EFTA
1995	Austria, Finland and Sweden leave EFTA to join the European Union (EU)
<i>Remaining members</i>	<i>Iceland, Liechtenstein, Norway and Switzerland</i>

Source: EFTA, 2014

EFTA does not have a common trade policy, such as a common external tariff, with respect to non-members, like customs union do. EFTA has three core tasks. The first is the liberalization of intra-EFTA trade. Second, the EFTA States have built networks of preferential trade relations in the world, currently consisting of 25 free trade agreements (FTAs) with 35 partners. Third, three of the four EFTA States – Iceland, Liechtenstein and Norway – are parties to the EEA Agreement<sup>(4)</sup>, which ensures their participation in the Internal Market of the European Union<sup>(5)</sup> (EFTA, 2014). As Table 1 shows EFTA has lost most of its members who chose closer economic integration by joining the EU.

The EU is moving towards an Economic Union. This involves not only abolition of tariff and quotas among members (like in the case of a free trade area such as EFTA), but also common tariff and quota system, abolition of restrictions of factor movements, as well as harmonization and unification of economic policies and institutions. The formation of an economic union requires nations to surrender a large measure of their national sovereignty to supranational authorities in union wide institutions. Not everyone supports ever closer European integration as the planned exit of Britain, Brexit, demonstrates.

The level of integration varies among countries within the EU as 19 out of 28 member states have adopted the euro (€) as their common currency and sole legal tender, see Figure 1. The formation of a common currency area can bring benefits to the members of the currency union, particularly if there is a high degree of international trade among them (i.e. a high level of trade integration). This is primarily because of the reductions in transaction costs in trade and the reduction in exchange rate uncertainty. However, there are also costs of joining a currency union, namely; the loss of independent monetary policy and the loss of the exchange rate as a means of macroeconomic adjustment.

In addition to economic theories on the gains from trade and economies of scale, as well as theories on economics of integrations, including common currency area, there are also theories on the behavior of small states within multilateral arrangements. Small states as well as large states have a choice to engage in bilateral negotiations and/or multilateral arrangements to address issues that cannot only be resolved within their borders. Bilateral negotiations are carried out between two nations focusing only on their interests. On the other hand, multilateralism is the international governance of the many, and in the case of the EU, 28-member states, large and small.

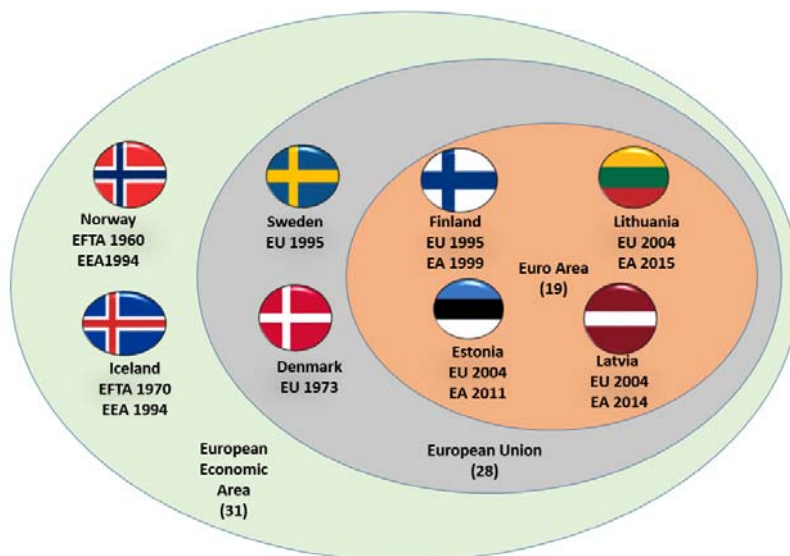
Multilateral negotiations open up the possibility for small states along with larger states to participate in international decision making. According to Thorhallsson (2005), the small states literature generally claims that it is beneficial for small states to concentrate on multilateral relations within international organizations. When discussing multilateralism Kahler (1992, p. 681) states that “Smaller, weaker states were believed to be disadvantaged by bilateralism...” and “[i]n their formal institutional design at least, most postwar multilateral institutions incorporated a larger role in decision making for states that were not great powers and could not aspire to be”. When discussing small states as aid donors, Hoadley (1980) predicts high levels of participation by small states in multilateral agencies. This would apply

to the United Nations (UN) as well as multilateral development banks. More recently, Evans and Newnham argue that small states are said to have limited involvement in world affairs, favor intergovernmental organizations, are advocates of international law, shy away from the use of military force and in general have limited, mostly regional, foreign policy priorities (Evans and Newnham, 1998, p. 500–501). Finally, Maass states that “[m]embership and participation in international governmental organizations is not only a frequent priority of small states, but it has also been discussed as an indicator of independence, and as such a secondary definitional requirement for small states in particular” (Maass, 2009, p. 69). A group of small states can also be influential as Ingebritsen argues, when discussing Scandinavian countries, that “these states exercise collective authority beyond their borders that exceed their military or economic might” (Ingebritsen, 2006, p. 1). She also argues that Scandinavians are likely to be found in groups that seek to strengthen international institutions. Scandinavian countries are indeed active participants in the UN and in multilateral development banks and among them Denmark, Finland and Sweden are EU members and give high priority to active participations within the EU institutional systems.

Keohane (1969) suggests that we focus on the systemic role that state leaders see their countries playing. This is critical to understand the impact countries can have on the international community. Keohane (1969) uses the following categories: System-determining when a state plays a critical role in shaping the international system; System-influencing are states that cannot expect individually to dominate the international system but may be able to influence it through unilateral or multilateral action; System-affecting states are those that cannot affect the international system if acting alone but can exert significant impact on the system if working through small groups or alliances or through universal or regional international organizations; and finally System-ineffectual states are those that can do little to influence the system-wide forces that affect them, except in groups which are so large that each state has minimal influence (Keohane, 1969).

How can this categorization contribute to the behavior of small states in international organizations? As Keohane (1969) observes, “...a major function of international organizations – perceived by many small and middle powers – is to allow these states acting collectively to help shape developing international attitudes, dogmas and codes of proper behavior” (Keohane, 1969, p. 297). For example, Iceland, acting alone or in partnership with a very large number of other countries, would have little impact and would be classified as system-ineffectual. Iceland could do little in most cases to influence system-wide forces. However, situations can exist, including international development cooperation, where small countries that work in partnership such as the Nordic-Baltic group could become system-affecting (see for example, Hilmarsson, 2011).

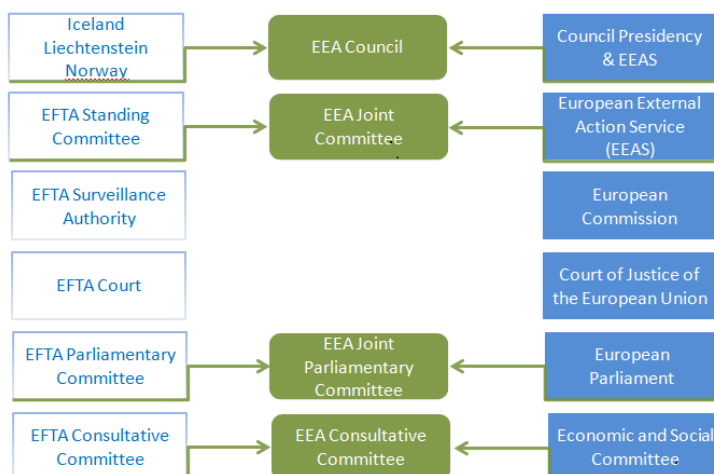
Iceland has in the past cooperated multilaterally with the Nordic countries and parliamentarians from those countries meet regularly in joint sessions. During the Cold War Iceland had strong bilateral relationship with the USA, a system-determining country, including a bilateral defense agreement. The political ties between the two countries could be critical in resolving disputes between Iceland and other countries most notably the dispute with the UK over fisheries territories. Post-cold war this relationship is weaker and does not provide the shelter it did in the past. Unlike Denmark, Finland and Sweden and the Baltic States, Iceland an EEA EFTA country (with Norway), is not an EU member and is not sheltered by EU institutions, see Figure 1. There is a possibility, at least in theory, that the Nordic-Baltic countries could become system affecting states within the EU if they cooperate as a group.

**Figure 1.** *Different levels of European integration: The Nordic Baltic group (NB8).*

**Source:** Constructed by the author

As Figure 1 shows the Nordic and the Baltic States, all small countries, have chosen different levels of European integration. Norway and Iceland have the lowest level of integration but the Baltic States and Finland – the highest level of integration.

Although the three EEA EFTA states do not have the right to participate directly in the political decision making within the EU institutions, the EEA Agreement provide their experts with the opportunity to contribute to the shaping of EU legislation at the preparatory stage. This is done via participation in the European Commission's (EC) expert groups and committees. These groups advise the EC with the drafting of new laws, which the EU Council of Ministers and the European Parliament subsequently adopt. The participation of EEA EFTA experts and representatives in over 500 of these committees and groups is a valuable opportunity to acquire information and contribute to new legislative proposals at the earliest stages of policy formation (EFTA, 2014). This, however, means that the EEA EFTA states need to allocate sufficient human resources to take full advantage of this opportunity and this has been a challenge for Iceland. The EEA Agreement is supported with its own institutions and a formal cooperative mechanism vis-a-vis the EU institutions. The mechanism for decision shaping has thus been formalized and if used wisely can enable the EEA EFTA states become system affecting in some cases, see Figure 2. This is in line with Keohane's (1969) theory discussed above.

**Figure 2.** *Decision shaping under the Two-Pillar Structure under the EEA Agreement.*

**Source:** EFTA, 2014

## Methodology

The methodology used in this article is the case study method. Compared to other research methods, a case study enables the researcher to examine the issues involved in greater depth. According to Yin (Yin, 2009, p. 101-102) six sources of evidence are most commonly used in case studies. These are: documentation, archival records, interviews, direct observations, participant-observation, and physical artifacts. Each of these sources has advantages and disadvantages and according to Yin one should “note that no single source has a complete advantage over all the others. In fact, the various sources are highly complementary, and a good case study will therefore want to use as many sources as possible” (Yin, 2009, p. 101). Among the sources of evidence used for the analysis in this article is secondary data, including analytic reports and scholarly literature such as peer-reviewed journal articles and books on the subject. Direct observation also plays a role as the author draws on his experience and observations while living in Iceland following the domestic dialogue on EU accession. The author also draws on his experience as a Special Advisor to the Minister for Foreign Affairs in Iceland from 1995 to 1999 and as a staff member of the World Bank in Latvia from 1999 to 2003, just before Latvia, another small country, became an EU member state. Preference is given to using well documented evidence that is publicly available and listed in the references. The author also conducted interviews and collected information at the European Central Bank in June 2015, the European Commission and European Free Trade Area in July 2015 and at the International Monetary Fund in July and December 2016. This case study does not present results that can be evaluated on the basis of statistical significance and one should be careful about generalizing or projecting the findings of one case study onto another case or situation. However, some lessons from the study could have wider relevance than for Iceland only. This is especially true for small open resource rich economies, dependent on access to a large common market, using its own currency, and with limited institutional capacity to respond to external shocks and pressures in an era of globalization.

### The Icelandic economy, its changing structure, international cooperation and 2008–2009 the economic and financial crisis

Iceland is a high income open economy that participates in major European cooperative projects, such as EFTA, the EEA, and Schengen as well as in NATO. In addition to that it is an active participant in cooperation within the Nordic Baltic Region. The Icelandic economy is the smallest within the OECD. Its size is about 0.1 percent of the US economy, 4 percent of the Danish economy, and 25 percent of the economy of Luxembourg, while it is more than 50% larger than the economy of Malta (CBI, 2014).

Iceland is classified by the World Bank Group as a high income economy but the small size of its economy reflects the country's small population which was 338.400 on January 1, 2017. Iceland is considered to be a Nordic country and has the characteristics of a Nordic welfare state. Gross National Income (GNI) per capita measured in terms of Purchasing Power Parities (PPP), according to World Bank data, amounted to nearly 39 thousand US dollars in 2013, the twenty-second highest in the world and the thirteenth highest among the OECD countries. Iceland's GNI per capita is lower than that in Denmark, Norway, and Sweden but marginally higher than in Finland and slightly above the EU average (CIB, 2014).

Historically, Iceland's prosperity has to a large extent been built on its comparative advantage in the marine and energy sectors (hydro and geothermal power), with investment and services as the main drivers of growth. Tourism has soared over the past few years and has become one of the main engines of export growth. In fact, tourism has established itself as the third pillar of the Icelandic economy (in addition to the fisheries and energy sectors), and as a result,

Iceland's economy has become better diversified. Currently Iceland's largest trading partner countries are the Netherlands, Germany, Norway, the US, and the UK (CIB, 2014). The Euro Area constitutes the largest trading area.

Over the past 10 years, the Icelandic labor market has had a participation rate consistently above 85 percent, one of the highest among OECD countries. In 2013, female participation was one of the highest in the OECD countries, with women accounting for 48 percent of the labor force. Participation rates among the young and the elderly have also been quite high (CIB, 2014). Unemployment is low compared to EU member states and currently is about 3.4 percent.

While Iceland participates in European integration via EFTA and the EEA agreement, its history shows that it is skeptical about the benefits deriving from participation in international organizations and has not build a strong institutional capacity to cooperate on a multilateral basis. This is not only true if one considers EU membership skepticism. Iceland has also not sought membership in as many institutions that other Nordic countries actively participate in, including the regional development banks<sup>(6)</sup>. Iceland tends to favor more informal multilateral arrangements, bilateralism and sometimes unilateralism during times of crisis (e.g. Hilmarsson, 2014; Dinh, Hilmarsson, 2012). This contradicts the small states theories discussed above.

Iceland was among the hardest hit economies during the global economic and financial crisis that erupted in 2008. Prior to the crisis Iceland had experienced strong economic growth and unprecedented expansion in cross-border investments, especially in the financial sector (e.g. Hilmarsson, 2013a and 2013b). According to the IMF the consolidated assets of the three main Icelandic banks increased from 100 per cent of GDP in 2004 to 923 percent at the end 2007, reflecting expansion overseas. By the end of 2007, almost 50 percent of the three largest banks' assets were held abroad (IMF, 2008, p. 11). The banks had been privatized several years before the crisis with a light touch regulation and weak supervision in the spirit of *laissez-faire* policies. Before the crisis the government of Iceland publicly announced its ambition to turn Iceland into an international financial center.

The three largest banks, representing about 85 percent of the banking system, all collapsed in just a few days in October 2008. The whole economy was severely affected by this economic turbulence. The krona sharply depreciated, GDP fell, inflation and unemployment rose and the government ran large fiscal deficits in the aftermath of the crisis, see Table 2. Unlike the fixed exchange rate regime and austerity programs implemented in some EU member states, the government sought to protect the welfare system resulting large fiscal deficit that it hoped would only be temporary. Sharp depreciation of the local currency was expected to boost exports and GDP growth like happened for example in Finland and Sweden in the early 1990s (e.g. Hilmarsson, 2014).

**Table 2.** *Iceland: Selected Economic Indicators 2007–2017*

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017 P
GDP 1/	9,4	1,5	-6,9	-3,6	2,0	1,2	4,4	2,0	4,0	7,2	5,5
Unemployment rate 2/	2,3	3,0	7,2	7,6	7,1	6,0	5,4	5,0	4,0	3,0	2,8
Inflation 3/	5,1	12,7	12,0	5,4	4,0	5,2	3,9	2,0	1,6	1,7	1,8
(Percent of GDP)											
Headline deficit 4/	4,9	-13,1	-9,7	-9,8	-5,6	-3,7	-1,8	-0,1	-0,8	12,4	0,9
Current account balance	-14,0	-22,7	-9,6	-6,6	-5,2	-4,0	6,0	4,0	5,4	7,9	6,2

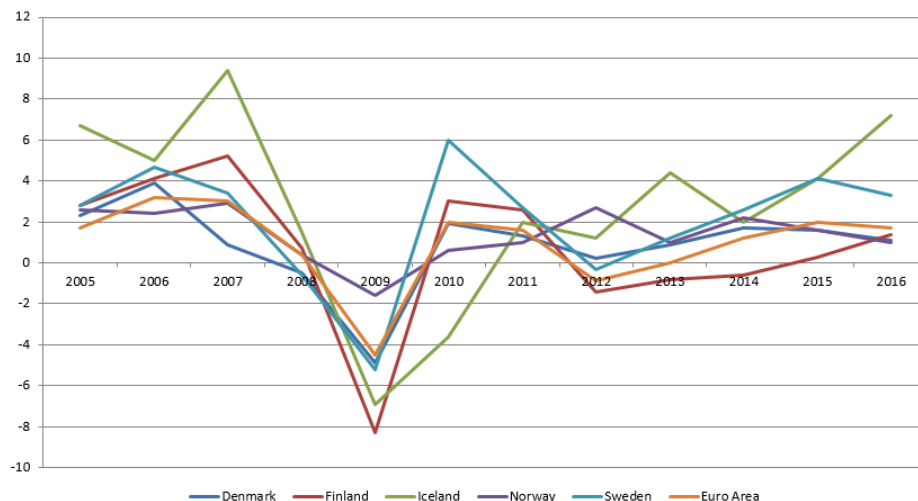
1/ Constant prices, present change; 2/ Percent of total labor force.; 3/ Average consumer prices, present change, 4/ General government net lending/borrowing.

P: Projections.

**Source:** IMF 2010, 2012, 2015a, 2015b and IMF World Economic Outlook Database October 2017.

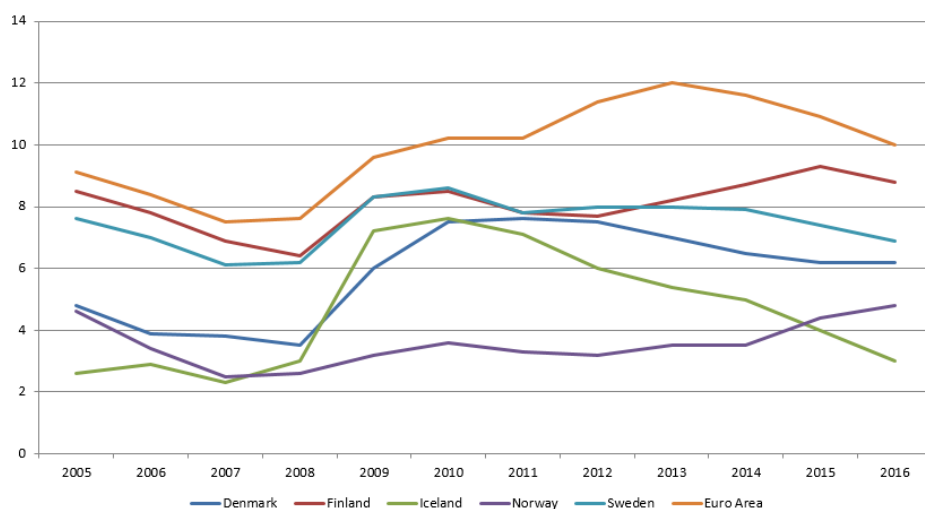
After about ten years since the crisis hit, Iceland has reached a relatively strong macroeconomic position with good growth prospects, see Table 2. GDP growth has been relatively high compared to the other Nordic countries and the Euro Area, see Graph 1 and unemployment relatively low, see Graph 2.

**Graph 1.** *Nordic Countries and Euro Area. Gross Domestic Product, constant prices. Percent change.*



Source: IMF World Economic Outlook Database 2017.

**Graph 2.** *Nordic countries and Euro Area. Unemployment rate. Percent of total labor force.*



Source: IMF World Economic Outlook Database 2017.

Pre-crisis there was a large current account deficit and post crisis the government ran a large fiscal deficit to stimulate the economy. Headline deficit and current account balance are now in surplus, see Table 2 and comparison with the other Nordics in Graph 3 and 4 in annex.

According to the Central Bank of Iceland the post-crisis contraction in GDP has been reversed in full (CBI, 2015). Public debt is on a downward sustainable path. Unemployment continues to trend down, now at 3.0 percent. Growth slowed in 2014 but pick up to around 7,2 percent in 2016, supported by robust domestic demand and tourism. Consumption has been boosted by household debt relief and – together with net trade – have benefited from favorable commodity prices (IMF, 2015).

There are concerns that economic stability may be threatened because of salary increases beyond the current growth rate. Large salary increase could undermine economic recovery and the competitive position of the economy, and lead to a reduction in employment (CIB,

2015). The government has been criticized for granting debt relief to households that to a large extent could have serviced their debt without such relief. This effort is also seen as discriminatory against those households who chose to rent their housing and socially vulnerable families who may be in greater need of assistance than homeowners. Amid low unemployment, wage pressures are building. There is a risk that the hard earned macro stability post-crisis may be lost if increases in salaries go out of control, with rising inflation, like has repeatedly happened in Iceland over the decades.

The Icelandic economy is still vulnerable, but better diversification, including in sectors generating foreign exchange helps maintain stability. Price stability is still within Central Bank of Iceland target and is helped by disinflation in key trading partners, particularly the Euro Area, a slump in oil prices, and an appreciating currency in the context of high exchange rate pass-through. This could change quickly as discussed above. The question remains if Icelanders have learned anything from the past – or if the economy will return to the boom and bust scenario yet again as it has for decades and most recently during the 2008 crisis.

### Advantages for Iceland joining the EU and the Euro Area

Among the key benefits of joining the European Union is that access to the common market. Iceland already enjoys this benefit via the EEA agreement, i.e., free flow of goods, services, capital and people across national borders. Iceland was also able to avoid the collapse of the Nordic Passport Union via its membership in Schengen. It thus enjoys many of the benefits (some would say most) of economic integration without EU membership and can thus to some degree both eat the cake and keep it.

In the future there could be questions about EEA sustainability. Will the EU still respect the EEA agreement in coming decades or is it only a temporary arrangement? Here partnership with Norway in EEA EFTA is critical. Should Norway become a member of the EU, Iceland would hardly have the capacity to engage in negotiations with the EU alone with Lichtenstein. Being a member of the EU Iceland could be more confident that the benefits of access to the single market would be in place in the longer term. Membership would also ensure regular consultations and participation in EU decision making instead of continuing to receive instructions via email from Brussels. Regular consultations could help a small country with limited institutional capacity increase professionalism.

European Union membership could possible shield Iceland during times of crisis, economically and in terms of security. There is greater need for outside support/shield given weaker ties with the USA post-cold war. Closer cooperation with EU member states and support from EU institutions could contribute to stability as Iceland has a history of economic boom and bust.

The risks associated with small population, including close ties between individuals, that can result in corruption and rent seeking could be reduced. During the 2008 crisis there was certain loss of confidence in the Icelandic political and institutional system. General elections took place in the spring 2009 and an EU application followed three months later. This is hardly a coincidence.

EU membership would mean that Iceland could possible after two years of membership join the Euro Area. Currently Iceland does not participate in EU's monetary system and cannot adopt the euro and also remain in good standing with the EU. The adoption of the euro unilaterally does not seem like a viable option (see, e.g. Buiter, 2000 and ECB, 2008). The exchange rate of the local currency has fluctuated greatly in the past and during the 2008 capital controls were introduced as a temporary measure and have now mostly been removed.

### Disadvantages for Iceland joining the EU and the Euro Area

In Iceland there is a concern about EU's Common Fisheries Policy (CFP) and Common Agriculture Policy (CAP). These potentially most difficult chapters, on the CAP and CFP, were not opened during accession negotiations so it is impossible to say if a compromise could have been reached and at what cost to Iceland. The nation is divided in its support. Membership of the EU has stronger support by employers outside the fishing industry and agriculture. The political importance of agriculture sector in Iceland is much greater than its economic contribution would suggest. By staying out of the EU Iceland avoids implementing the CFP and CAP of the EU.

If Iceland becomes a member of the EU, its influence within such a large institutional structure would be minimal. In fact, given its small size influence via membership would be a token benefit only. Iceland would also have a tiny weight in the Euro Area economy should it adopt the euro. A common currency would have limited Iceland's possibilities to respond to the 2008 crisis when depreciation of the króna played an important role in bringing about adjustment of Iceland's trade deficit.

Small states have experienced difficulties in dealing with the larger EU states and EU institutions and this became clear during the 2008 crisis. Large EU states, supported by the EU institutions, do not hesitate to use strong arm tactics against small states. An example of this is EU's handling of the crisis in Ireland and Latvia. The UK and the Netherlands, supported by the EU also used strong arm tactics against Iceland during the so called Icesave dispute. The Icesave dispute had negative effects on the sentiments in Iceland towards the EU and European nations, including the Nordic countries (who supported the Netherlands and UK in its dispute with Iceland during the crisis).

When discussing Iceland's response to the crisis the European Central Bank comments as follows: "When Iceland's policy response in the wake of the crisis is compared with that of other affected countries, there are two measures that stand out most. First, Iceland introduced capital controls to protect itself from the worst repercussions of the sudden reversal of capital flows that it faced at the end of 2008, a strategy that has possibly aided its subsequent recovery. However, as time goes by, evidence is mounting regarding the distortive and often detrimental effects that these restrictions are having on the decision-making of economic agents and the difficulties that Iceland's authorities face in decisively reducing the substantial stock of krónur that continues to be held offshore and returning to a fully liberalized capital account in the near future. Second, Iceland decided not to nationalize the debts of its oversized banking sector, instead opting to inflict losses on its financial institutions' creditors and foreign depositors. Although this saved the government from assuming liabilities that would potentially have been beyond its debt-servicing capacity, it also opened the door to a series of legal challenges (with final decisions still pending in some instances), thereby introducing a significant degree of uncertainty for authorities, businesses, foreign investors and the general public" (ECB 2012, p. 97).

Talking about "a series of legal challenges" and "a significant degree of uncertainty for authorities" could be viewed as comment or advice from the EU, but one could also view this comment as a threat. A small nation that does not yield to the EU and its larger member states will sooner or later suffer the consequences. The case of Latvia and Ireland comes into mind. Such comments or threats are not likely to increase confidence in the European Union in Iceland.

Eventually the Icesave dispute went to the EFTA Court<sup>(7)</sup> where Iceland came out as the winning party. After receiving the court ruling the Icelandic Ministry for Foreign Affairs commented as follows: "The EFTA Court ruling on Icesave rejected all claims by the EFTA Surveillance Authority that Iceland should be declared in breach of the EEA Agreement. The Court rejected the claim that Iceland has breached the Deposit Guarantee Directive or has



discriminated against depositors' contrary to EEA law. It is a considerable satisfaction that Iceland's defense has won the day in the Icesave case; the EFTA Court ruling brings to a close an important stage in a long saga" (Ministry for Foreign Affairs, 2013). Had Iceland yielded to EU demands this could have brought its debts to an unsustainable level.

Several scholars have commented on the damaging effect the Icesave dispute had on Iceland's sentiments towards the EU. Professor Gylfi Magnússon, who served as a Minister for Economic Affairs in the government coalition after the crisis hit, commented as follows: „The governments of Britain and the Netherlands have not directly linked the dispute about Icesave to Iceland's application for membership of the EU, but individual politicians in these countries, especially the Netherlands, have done so, e.g. encouraged their countries to oppose the progression of the application unless Iceland accedes to their demands. Understandably, such threats are very hard for Icelanders to swallow and they have undermined support for EU membership in Iceland. The Icesave dispute has undoubtedly had a very negative effect on many Icelanders' attitudes to other European nations and the EU and has fueled nationalism and isolationism“ (Magnusson, 2010). Thorhallsson and Rebhan comment as follows: „...while Iceland struggled to obtain assistance from the International Monetary Fund (IMF), Britain and the Netherlands allegedly blocked such assistance on a number of occasions, with the formal and informal approval of other European states.“ (Thorhallsson and Rebhan, 2011)

It is hard to be impressed with EU's handling of its post crisis problems. Currently one can say that the EU is faced with three crises: (i) a financial crisis, including a banking and a debt crisis), (ii) an economic policy crisis, including austerity programs, cutting welfare programs and increasing taxes, and (iii) a political crisis, where market forces compete against democracy. Post crisis economic performance in the EU is characterized by slow economic growth and long-term unemployment (especially among the youth) and increasing income inequality. It is unlikely that Iceland will want to join during this current period of uncertainty.

The exit of the UK from the EU only adds to the uncertain future of the EU. It is currently hard to predict how exactly Brexit will affect Iceland. If Brexit slows global growth or growth within the European Economic Area this will also affect Iceland. In spite of tensions between Iceland and the UK from time to time the UK remains among Iceland's most important trading partners. Should Brexit mean exit from the European Economic Area it seems likely that the governments of Iceland and the UK will work out other arrangements to ensure continued trade flows between countries.

**Table 3.** *Summary of advantages and disadvantages of Iceland joining the EU and the Euro Area*

Advantages	Disadvantages
<ol style="list-style-type: none"> <li>1. Key benefits of joining the European Union is that access to the common market, but Iceland already enjoys this benefit via the European Economic Area agreement.</li> <li>2. With European Union membership Iceland could be more confident that the benefits of access to the common market would be in place in the longer term.</li> <li>3. Regular consultations with the European Union could help a small country such as Iceland with limited institutional capacity to increase professionalism in its public administration.</li> <li>4. European Union membership would ensure regular consultations and participation in European Union decision making.</li> <li>5. European Union membership could possible shield Iceland during times of crisis, economically and in terms of security.</li> <li>6. European Union membership would mean that Iceland could possible after two years of membership join the Euro Area which could contribute to economic/monetary stability.</li> </ol>	<ol style="list-style-type: none"> <li>1. In Iceland there is a concern about EU's Common Fisheries Policy (CFP) and Common Agriculture Policy (CAP). These potentially most difficult chapters, on the CAP and CFP, were not opened during accession negotiations so it is impossible to say if a compromise could have been reached and at what cost to Iceland.</li> <li>2. If Iceland becomes a member of the European Union, its influence within such a large institutional structure would be minimal.</li> <li>3. Small states have experienced difficulties in dealing with the larger European Union member states and European Union institutions and this became clear during the 2008/9 economic and financial crisis.</li> <li>4. With euro adoption, Iceland would lose its independent monetary policy, including the possibility to use the exchange rate of the local currency as a means of macroeconomic adjustment.</li> <li>5. Iceland would have a tiny weight in the Euro Area economy should it adopt the euro.</li> <li>6. It is hard to be impressed with EU's handling of its post crisis problems. GDP growth remains low and unemployment remains high both within the European Union and the Euro Area. Iceland's economic performance post crisis in more favorable than European Union performance.</li> </ol>

**Sources:** Constructed by the author

### The consequence of small economic size for Iceland

It is clear that outside the European Union a country like Iceland can be vulnerable because of small size, small institutions with limited institutional capacity and corruption. The government has not build strong capacity to work with large multilateral organizations and favors small multilateral structures such as EFTA, Nordic cooperation, and bilateralism if possible, and sometimes unilateralism during crisis (see, for example, Hilmarsson, 2014).

Iceland is vulnerable when larger nations, including EU and EU member states use strong arm tactics to resolve disputes. There is a tendency within the EU to exercise authority with unilateral force, sanctions and threats. This was the case with Icesave as well as when Iceland has had disputes with the EU on the utilization of fisheries sources. This strong arm tactic is unlikely to impress Icelanders.

Nordic cooperation is important for Iceland and Iceland cooperates closely with Nordic countries and the Baltic States in multilateral institutions such as the World Bank, IMF and EBRD. The 2008 crisis showed that Nordic countries are unreliable partners when under pressure from larger EU states. Dispute with larger EU member states supported by the EU, especially during the crisis, has severely damaged EU's image in Iceland.

### Conclusions

The Icelandic economy has recovered from the 2008 global economic and financial crisis. Current economic growth is healthy and unemployment is low compared with high income European Union countries, including the other Nordics. Headline deficit is in balance and the current account is in surplus. The economy is now better diversified than it was a decade ago. In terms of foreign exchange revenues, it is based mainly on three main pillars, (i) the traditional fisheries sector, (ii) aluminum production using domestic clean energy sources and (iii) a flourishing tourism sector.

After the 2008 crisis hit there was certain loss in confidence in the Icelandic institutional systems leading to a European Union application submitted by the government in July 2009. The sharp depreciation of the domestic currency, króna, during the crisis and its historic fluctuations and loss of value over the decades due to monetary mismanagement also called for the adoption of a new currency where the euro would be the most likely option. However, euro adoption would require EU membership and a two-year period demonstrating sound economic management according to EU criteria. While unilateral adoption of the euro is possible in theory, it seems unrealistic politically and is strongly opposed by the EU. Furthermore, a common currency would have limited Iceland's possibilities to respond to the 2008 crisis when depreciation of the króna played an important role in bringing about adjustment of Iceland's trade deficit.

The so-called Icesave dispute with the UK and the Netherlands appears to have had damaging effect on how Icelanders view the European Union. Perceived EU backing of claims from the UK and the Netherlands has changed the way Icelanders view the EU and European countries and public support for EU membership is low post crisis. The government that took office in May 2013 withdraw the EU application and informed the EU that Iceland should no longer be considered an EU candidate country. National support for EU accession post crisis remains low according to recent public opinion polls. The new government that took office in November 2017 has no intentions to reapply for EU membership.

Iceland clearly benefits economically from the access to the EU common market via the EEA agreement, enjoying gains from trade and economies of scale. This is possible as long as the EU is willing to respect the EEA agreement and as long as Norway is part in the EEA agreement. Without Norway, Iceland would not have institutional capacity to cooperate with

the EU under the agreement and given the small size of Iceland and Lichtenstein it is doubtful if the EU would be interested in such cooperation.

Should Iceland become a member of the EU it is clear that the union would only give a small weight to Iceland in its decision making given its small population and economic size. This would also apply to the ECB should Iceland eventually become a member of the Euro Area. According to Keohane's theory, Iceland as an EU member would fall under "system-ineffectual states" category, i.e. those states that can do little to influence the system-wide forces that affect them, except in groups which are so large that each state has minimal influence. Iceland could strive to become a "system-affecting state" i.e. among those states that cannot affect the international system if acting alone but could exert some impact on the system by working through small groups or alliances. Cooperation with like-minded nations, especially the Scandinavian countries, and to some extent the Baltic States could be an option to consider. Those countries for example cooperate within the World Bank, the IMF and the EBRD (e.g. Hilmarsson, 2011). However, during times of crisis, experience shows that Iceland cannot rely on support from those small states that are more likely to follow their own interest or that of larger more powerful EU member states. This became clear during the 2008 crisis and the Nordic countries also did not support Iceland strongly during the in its fisheries disputes with the UK.

Iceland has always been reluctant to participate in international organizations unless benefits from such participation are clear, such as in NATO that also involved a bilateral defense agreement with the USA with both security and economic benefits attached. Unlike the other Nordic countries, the government has not build strong capacity to cooperate with international organizations and has preferred less formal structures and lower level of economic and political integration by being a member of EFTA and the EEA agreement.

One can argue that a small country like Iceland needs a shield post crisis when it no longer benefits from strong bilateral relations with the United States, a system determining country. History shows that Iceland has preferred to use bilateral relations in solving its problems in the past and during crisis sometimes makes unilateral moves. In crisis situations Iceland has not hesitated to take actions against larger nations or group of nations including during the so called Cod Wars and during the 2008 global crisis. These unilateral actions have been successful. This contradicts the small states literature that generally claims that it is beneficial for small states to concentrate on multilateral relations within international organizations. The Icesave dispute also shows that an EU shield could come at a high cost when the EU supports the claim of larger EU nations like during the Icesave dispute. Furthermore, the experience of Latvia and Ireland during the 2008 economic and financial crisis further confirms that EU shield can come at a high cost.

The question remains what the most feasible arrangement is for long term prosperity of Iceland? The slow growth, high unemployment and ongoing crisis in some European Union and Euro Area member states do not make EU membership attractive at least in the short term. There are issues related to cohesion and economic stability within the EU especially the southern Europe performing poorly compared to the northern Europe. The exit of the UK from the EU only adds to the uncertain future of the EU. It is currently hard to predict how exactly Brexit will affect Iceland. Should Brexit mean exit from the European Economic Area it seems likely that the governments of Iceland and the UK will work out other arrangements to ensure continued trade flows between countries.

EFTA membership and the EEA agreement appear to be the best arrangement for Iceland at present as this arrangement ensures access to the internal EU market. The relations between EFTA/EEA and EU could, however, change in the medium or long-term and the decision made by the government of Iceland that Iceland should not be considered a candidate or at

least a potential EU candidate country may have been short sighted given how quickly the global environment can change. Iceland should maintain good relations with the European Union.

---

## Notes

---

- (1) Parliamentary elections took place on October 28, 2017 a new coalition between the Left-Green Movement, the Independence Party and Progressive Party was formed and took office in November 2017.
- (2) In addition to economic benefits to economic integration there can also be important political and security concerns that drive the integration process.
- (3) The European Free Trade Association is an intergovernmental organization set up for the promotion of free trade and economic integration to the benefit of its Member States (today Iceland, Liechtenstein, Norway and Switzerland). The Association is responsible for the management of: The EFTA Convention, which forms the legal basis of the organization and governs free trade relations between the EFTA States; EFTA's worldwide network of free trade and partnership agreements; and The Agreement on the European Economic Area, which extends the Internal Market of the European Union to three of the four EFTA States (Iceland, Liechtenstein and Norway) (EFTA, 2014).
- (4) The EEA Agreement does not include the following EU policies: Common Agriculture and Fisheries Policies; Customs Union; Common Trade Policy; Common Foreign and Security Policy; Justice and Home Affairs (the EFTA States are part of the Schengen area); Economic and Monetary Union (EMU).
- (5) The EEA EFTA States do not have the right to participate in the political decision making within the EU institutions. The EEA Agreement does, however, provide the EEA EFTA State experts with the opportunity to contribute to the shaping of EU legislation (EFTA, 2014).
- (6) Those are the African Development Bank, the Asian Development Bank and the Inter-American Development Bank.
- (7) The EFTA Court, based in Luxembourg, corresponds to the Court of Justice of the European Union in matters relating to the EEA EFTA States. The Court deals with infringement actions brought by ESA against an EEA EFTA State with regard to the implementation, application or interpretation of an EEA rule. The Court also handles the settlement of disputes between two or more EEA EFTA States. It hears appeals against decisions taken by ESA and gives advisory opinions to courts in the EEA EFTA States on the interpretation of EEA rules (EFTA, 2014).

---

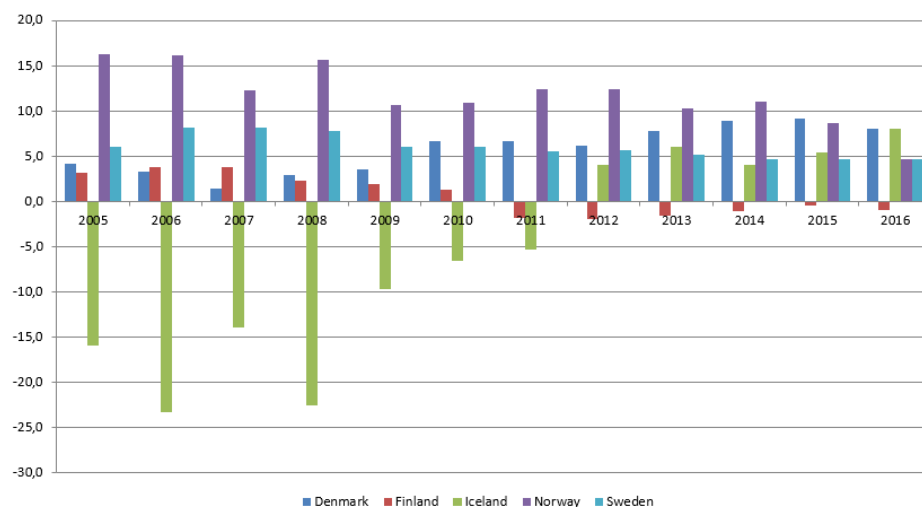
## References

---

- Buiter, W.H., 2000. Is Iceland an Optimal Currency Area? Central Bank of Iceland. Working Paper, No. 10. Available at: <[http://www.sedlabanki.is/uploads/files/wp\\_10.pdf](http://www.sedlabanki.is/uploads/files/wp_10.pdf)> [Accessed on April 28, 2017].
- Central Bank of Iceland, CIB, 2015. Monetary Bulletin. Vol. 17. No. 2. 13 May 2015. Available at: <<http://www.cb.is/publications/publications/publication/2015/05/14/May-2015/>> [Accessed on May 26, 2017].
- Central Bank of Iceland, CIB, 2014. Economy of Iceland. Available at: <<http://www.cb.is/publications-news-and-speeches/news-and-speeches/news/2014/09/19/Economy-of-Iceland-2014/>> [Accessed on May 26, 2016].
- Czinkota, M.R., Ronkainen, I.A., Moffett, M. H., Marinova, S., Marionv, M., 2009. International Business, European Edition. John Wiley & Sons, Ltd. England.
- Dinh, T.Q. and Hilmarsson H.P., 2012. Private Sector Export to Emerging Market Economies During Times of Crisis: How Can Export Credit Agencies Help? *Review of International Comparative Management*, Volume 13, Issue 1, March 2012, pp. 167-180.
- European Central Bank, ECB, 2012. Recent Economic and Financial Developments in EU Candidate Countries. ECB Monthly Bulletin November 2012. Available at: <[https://www.ecb.europa.eu/pub/pdf/other/art2\\_mb201211en\\_pp87-104en.pdf](https://www.ecb.europa.eu/pub/pdf/other/art2_mb201211en_pp87-104en.pdf)> [Accessed on April 18, 2017].
- European Central Bank, ECB, 2008. The adoption of the euro: principles, procedures and criteria Speech by Jürgen Stark, Member of the Executive Board of the ECB delivered at the Icelandic Chamber of Commerce Reykjavik, 13 February 2008. Available at: <<https://www.ecb.europa.eu/press/key/date/2008/html/sp080213.en.html>> [Accessed on January 8, 2018].
- EFTA, 2014. This is EFTA. Available at: <<http://www.efta.int/sites/default/files/publications/this-is-efta/this-is-efta-2014.pdf>> [Accessed on March 5, 2017].

- Evans, G. and Newnham, J., 1998. *The Penguin Dictionary of International Relations*. – London: Penguin Books.
- Hilmarrsson, H.P., 2014. Small States in a Global Economy - Crisis, Cooperation and Contributions. Series on Economic Issues, Problems and Perspectives. Nova Science Publishers, Inc.
- Hilmarrsson, H.P., 2013a. The Banking Crisis in Iceland: Did the Government Pretend that Facts from Reality were Other than they Were?, in Tiia Vissak, Maaja Vadi (ed.) *(Dis)Honesty in Management (Advanced Series in Management, Volume 10)*, Emerald Group Publishing Limited, pp. 61-84. DOI:10.1108/S1877-6361(2013)0000010008.
- Hilmarrsson, H.P., 2013b. Small states and big banks - the case of Iceland. *Baltic Journal of Economics - Taylor & Francis Routledge*, 13(1) (2013), pp. 31-48.
- Hilmarrsson, H., 2011. How can the Baltic States as Non-DAC donors best contribute to international development cooperation? *Baltic Journal of Economics - Taylor & Francis Routledge*, (2) (2011), pp. 27-40.
- Hoadley, J.S., 1980. Small states as aid donors, *International Organizations* 31, 1, Winter 1980, pp. 121-137. Available at: <<http://www.jstor.org/stable/2706619>> [Accessed on April 1, 2017].
- IMF, 2015a. IMF Executive Board Concludes 2014 Article IV Consultation and Fifth Post-Program Monitoring Discussion with Iceland. Available at: <<http://www.imf.org/external/np/sec/pr/2015/pr15114.htm>> [Accessed on May 2, 2017].
- IMF, 2015b. Iceland: 2014 Article IV Consultation and Fifth Post-Program Monitoring Discussions-Staff Report; Press Release; and Statement by the Executive Director for Iceland. Available at: <<http://www.imf.org/external/pubs/cat/longres.aspx?sk=42782.0>> [Accessed on May 3, 2017].
- IMF, 2012. Iceland: Staff Report for the 2012 Article IV Consultation and First Post- Program Monitoring Discussion. Available at: <<http://www.imf.org/external/pubs/cat/longres.aspx?sk=25853.0>> [Accessed on May 3, 2017].
- IMF, 2010. Iceland: 2010 Article IV Consultation and Third Review under Stand-By Arrangement and Request for Modification of Performance Criteria-Staff Report; Staff Supplement; Public Information Notice and Press Release on the Executive Board Discussion; and Statement by the Executive Director for Iceland. Available at: <<http://www.imf.org/external/pubs/cat/longres.aspx?sk=24256.0>> [Accessed on May 3, 2017].
- IMF, 2008. Iceland: Financial system stability assessment — Update. Available at: <<http://www.imf.org/external/pubs/ft/scr/2008/cr08368.pdf>> [Accessed on May 3, 2017].
- Ingebritsen, C., 2006. *Scandinavia in world politics*. Rowman & Littlefield Publishers.
- Institute of Economic Studies at the University of Iceland. (2014). Status of the accession negotiation between Iceland and the EU. Available at: <<http://www.mfa.is/status-of-the-accession-negotiations-between-iceland-and-the-eu/>> [Accessed on April 29, 2017].
- Kahler, M., 1992. Multilateralism with small and large numbers. *International Organizations*, Vol. 46, No. 3 (Summer, 1992), pp. 681-708. Available at: <<http://www.jstor.org/stable/2706992>> [Accessed on April 1, 2017].
- Keohane, R.O., 1969. Lilliputians' Dilemmas: Small States in International Politics. *International Organizations*, Vol. 23, No. 2 (Spring, 1969), pp. 291-310.
- Maass, M., 2009. The elusive definition of the small state. *International politics*, 46(1), pp. 65-83. Available at: <<http://www.palgrave-journals.com/ip/journal/v46/n1/abs/ip200837a.html>> [Accessed on April 2, 2017].
- Magnusson, G., 2010. Iceland and the importance of becoming a member of the EU family. Available at: <<http://www.atvinnuvegaraduneyti.is/radherra/raedurGM/nr/2826>> [Accessed on March 5, 2017].
- Ministry for Foreign Affairs, 2015. Letter from the Minister for Foreign Affairs to the European Commission. Available at: <<http://www.mfa.is/media/gunnar-bragi/Bref-ESB-ENS-pdf.pdf>> [Accessed on April 27, 2017].
- Ministry for Foreign Affairs, 2013. Iceland welcomes acquittal in Icesave case. Available at: <<http://www.mfa.is/news-and-publications/nr/7515>> [Accessed on April 29, 2017].
- Thorhallsson, B. and Rebhan, C., 2011. Iceland's Crash and Integration Takeoff: An End to European Union Skepticism? *Scandinavian Political Studies*, Vol. 34, No.1, 2011, pp. 53-73. Available at: <<http://onlinelibrary.wiley.com/doi/10.1111/j.1467-9477.2010.00261.x/abstract>> [Accessed on April 6, 2017].
- Thorhallsson, B., 2005. What features determine small states' activities in the international arena? Iceland's approach to foreign relations until the mid-1990s. *Stjórnmal og stjórnsýsla – Vefúmarit, Stofnun stjórnmála og stjórnsýslu*, Háskóli Íslands. 1:1, pp. 107-140. Available at: <[http://www.irpa.is/article/view/861/pdf\\_4](http://www.irpa.is/article/view/861/pdf_4)> [Accessed on May 6, 2017].
- Yin, R.K., 2009. *Case Study Research. Design and Methods* (4th ed., Vol. 5). – California: SAGE Inc.

## Annex

**Graph 3.** *Nordic countries. Current account balance. Present of GDP.*

**Source:** IMF World Economic Outlook Database 2017.

**Graph 4.** *Nordic countries. Headline deficit. Present of GDP.*

**Source:** IMF World Economic Outlook Database 2017.

# The role of fiscal policies in maintaining macroeconomic stability. A DSGE model approach

**George PASMANGIU**

Bucharest University of Economic Studies  
pasmangiu\_george@yahoo.com

**Abstract.** *In this paper I have analyzed the basic structure of The New-Keynesian DSGE models, which include a governmental component, a fiscal policy model with multiple implications in macroeconomic stability. In order to describe elaborated is the system of models, I will illustrate for this purpose a few previous publications within the specialized literature of this domain. The case study will focus on a basic DSGE model representing Romania's emerging economy. The data used are the structural parameters of this economy, and the actual structure of the model system contains basic macroeconomic variables, such as real GDP, private consumption, gross investments, public expenditure and public debts. The chosen methodology for settling the system is the Blanchard-Kahn technique. The result is a vector, containing the stable solution and the unstable solution of the model. The unique and stable solution represents the value of the fiscal policy shock variable.*

**Keywords:** DSGE models, fiscal policy, Taylor's rule, macroeconomic stability, MATLAB.

**JEL Classification:** D58, E62, E63, C62, C63.

## 1. Introduction

The problems of macroeconomic stability and instability are among the most complex ones and can be exposed through a number of different methodologies, such as DSGE models (Dynamic stochastic general equilibrium). There are two types of DSGE models: RBC models (Real Business Cycle) and New Keynesian models. (NK models). RBC are generally production and utility functions that do not involve the use of governmental policy models. NK models also include using the mix of fiscal and monetary policies. This work is focused on the implications of macroeconomic stability, on its own domestic tax destabilizations.

Most New Keynesian models analyze cases where monetary policy is active, and fiscal policy is considered passive. A passive policy generally reacts to no influence, internal or external, so it is not possible for a reaction function to be formulated. In order to highlight the role of fiscal policies, in this paper I considered the fiscal policy to be active and defined by a reaction function similar to that of a monetary policy, a Taylor's rule function.

Unlike linear regression models, DSGE models do not necessarily use the values of economic variables involved in models to estimate links and influences between these variables. This type of models can also be used for demonstrative, illustrative purposes, such as this paper, in order to establish the structural making of any economy. The DSGE models uses initial values, a priori, of the parameters found in the structure of built equations, which the researchers select from the entirety of the specialized literature in the field. This procedure is called calibration and it is considered to be the most rudimentary and most uncertain approach. Another variant would be the Bayesian estimation approach, which creates parameters with a posteriori values, through the use of probabilities attached to parameters and statistical filters. The method chosen in the practical segment of this study is calibration, because the estimation of Bayesian is generally used in complex DSGE systems, which employ many economical agents and therefore many component models. The models I will use consists of three equations and each of them represents the economic behavior of a market agent. The economical agents involved are households, firms and the government. The government is acting, of course, through fiscal policy, built as a reaction function similar to Taylor's rule, companies are described by a modified Calvo model, and the behavior of households is explained through the use of private consumption utility function.

The purpose of this present work does not focus on a complex calculation of the resolution for this system of econometric equations, but to promote in itself a different perspective of DSGE model systems, in the light of an active fiscal policy and in the absence of the policy Monetary assets. The motivation behind the composition of this study is a previously acquired inclination to related topics with taxation, some of which were the theme of my license and dissertation.

Further on, in the second section, I will elaborate a summary of the specialized literature focused on the theme of New Keynesian DSGE models, in whose composition the monetary and fiscal policy models enter, thus mentioning the most important articles based on this topic written by famous authors. Section Three comprises the case study, in which I will expose the details of the DSGE model with active fiscal policy, followed by section four, with the resolution of the model. The latest sections contain the bibliographic references.



## 2. Literature review

In the paper of (Blake and Markovic, 2007), the main discussion is whether the macroeconomic stability of the UK's open economy is provided by pure luck, in other words the lack of external shocks, or by the improvement of monetary policies over time. Most researchers most certainly agree that the main cause for the reduced variability of targeted macroeconomic variables, real GDP and inflation, is the lack of shocks from abroad.

In order to prove this fact, Blake and Markovic used the data from the UK, the US and the combined economic offered by the rest of the world, marked as ROW. The model they use is actually a set of DSGE models, in which the behaviors of each main type of economic agent are modelled separately. Economic agents examined are the following: households, firms and government. Households are the ones that consume products manufactured by companies and offer instead labor force and capital for the same firms and, on the top of the microeconomic activity, there is a government which establishes charges and taxes, and then collects from households and businesses as public incomes, and makes government spending. Governments act through fiscal and monetary policies, but fiscal policy remains passive in their model, which means that the Government's entire activity is represented by the monetary policy model, a Taylor's rule equation, which determines the real value of an interest rate, with the use of inflation shock coefficients. All parameters derived from the equation are calibrated to suit the economic conditions of UK, USA and ROW. Most of these parameters are borrowed from previous studies carried out by different authors. In their opinion, a good monetary policy arises when a coefficient associated with inflation is greater than 1 and, on the other hand, a value of less than 1 happens in the case of poor monetary policies. An impulse-response analysis shows how it affects the American-British economies and in what way. The whole of UK stability depends on the quality of their internal monetary policy in most situations, which means that they must have a good policy all the time to survive. If the U.S. policy is also good, then the risk of external shocks originated from their economy is very low. The best case occurs when all the economies around the world run the same effective policies and the model presents a single solution. The more inefficient policies you encounter in the model, the more unstable solutions the model will have. A sensitivity analysis, performed by researchers helps to determine the narrowest down number of unstable solutions and to find the most stable one.

The objective of finding the optimum monetary policy is gathered alongside the importance and introduction of financial accelerators in the macroeconomic stability of India (Anand, Giorgia, Saxegaard, 2010). Financial accelerators in the economy are represented by entrepreneur, those dealing with external and domestic debt. The work itself states that the external debt is the main cause of economic instability in open emerging economies, such as India. Its present model has 4 categories of economic agents: households, entrepreneurs, the capital producers and retailers plus the fiscal and monetary authority. This is something a little more complex than the average DSGE model building. The monetary policy model is a modified Taylor rule based equation, where the value of nominal interest rates changes through the inflation gap, real output gap and the nominal exchange rate deviation. The methodology used is a Bayesian estimate, which uses initial values of structural parameters, and instead gives the posterior values of these parameters, after being processed together with the analyzed macroeconomic variables. Finally, the financial accelerator, represented by entrepreneurs, manages to improve the model and provide a good insight as the net value and their debts can shock the entire Indian economy. Due to its presence, the monetary policy

model focuses on reducing nominal exchange rate volatility and the depreciation rate of their national currency, all while increasing domestic shock inflation on other macroeconomic factors.

The applicability of DSGE models extends with the work of Cem. (Cem, 2011). Macroeconomic stability models serve in this case, as a purpose, the enabling of accession to the European Union for Turkey. The set of models is divided between models for households, firms and government. The Government will act by means of monetary and fiscal policy, both of which are active. From the model addressed to households we can see directly the involvement of fiscal policies. Alongside the private consumption of goods, the end consumers of the Turkish economy are described also as consumers of public goods, which leads to the inclusion in the model of the government spending variable. The organizational structure of the companies is a production function with a technological shock based only on the labor force, and the price of goods is divided between companies that want to optimize their prices at new values and firms that will maintain their older prices. In terms of monetary policy, the nominal monetary policy rates built by the central bank are calculated according to the deviation of inflation from its steady state values and the deviation of the output level from its steady state. Of these two influences, caring for price stability, through a low level of inflation, is the one that matters for the monetary policy. Fiscal policy, like the monetary policy, is also based on a reaction function, somewhat similar to those based on Taylor's rule. The representative tax instruments are the share of government spending in GDP and the share of tax revenues in GDP, sometimes known in the literature as fiscal pressure, or tax burden. The two variables are considered to be equally balanced, with no budget deficit. Both variables depend on their last value, the value of the output at a previous time and the current worth of the financial public debts. Along with the reaction function, a tax constraint is also required, describing the degree of solvency of the government by calculating the financial debt depending on the nominal interest rate, the previous amount of the debt, inflation surplus. This fiscal policy focuses on smoothing the government's debt level and stabilizing the real output level of the Turkish economy.

Their results are indeed encouraging, as the a posteriori parameters are similar in comparison to those of the developed countries of European Union, so it can be said, by means of such research that Turkey could join the Union in the future, since the degree of convergence is high.

Strictly on monetary policy, Taylor (Taylor, 1999) is historically assessing monetary policy patterns and models. This retrospective of the various monetary regimes in U.S. history is also accompanied by an analytical evaluation based on dynamic stochastic models over time. From the derivation of the quantitative equation for the determination of the monetary mass, elaborated by Friedman and Schwartz (Friedman and Schwartz, 1963), Taylor proposes a new instrument for measuring monetary policy performance, namely the short term nominal rate of interest. The calculation of this monetary policy interest rate will take the form of a function built around two variables, inflation and real GDP. Claiming a steady rate of monetary growth, Taylor stated that the rotating speed of the latter, considered as an interest rate calculated by central banks, depends on the value of price variations and actual output in a economy, unaffected by inflation. This function will serve as a rule for creating an optimal monetary policies, because the higher the  $h$  and  $g$  coefficients, associated with the real inflation and GDP, the greater the efficiency of such a rule increases. In other words, the rate of interest will reflect in its worth, no matter how small or large it will be, the high sensitivity to the

modification of essential economic indicators for stability. The Federal Reserve Authority has used this analytical method since the beginning of the years 90 '. At the same time, Taylor used the model to estimate econometrical, through the smallest squares method, the situation of policies past the three ages: the age of the gold standard, which was anterior to the Bretton Woods system and the age posterior to it. The three periods are then compared with the present for the purpose of detecting policy mistakes. These mistakes in the exercise of policies are considered to be deviations from the policy rule chosen by the author, with positive and significant parameters as value. Low values of  $h$  and  $g$  coefficients, associated with inflation and real GDP, in the first two ages, are found to present multiple fluctuations in inflation and output and persist in the second period. As time goes by, the value of these parameters will increase by the end of the years 90 ', the last period which adopted the effective model of optimal monetary policy. A high value of these two parameters allows the policy, through the Taylor rule, to achieve its fundamental objectives regarding the macroeconomic stability. These objectives will always be price stability, low inflation, and increased control of real production at the economy level, correlated with the growth rate of monetary mass.

The report paper made by a group of researchers (Clarida, Gaults and Gertler, 1998) comprises a characterization of the United States monetary system throughout the postwar period. This period is divided into two subperiods, the one before the year 1979, prior to the appointment of Volcker as chairman of the Federal Reserve System (FED) of the United States and after his appointment as president of FED. In order to achieve this objective, the forecasting reaction functions were mainly used. These functions have their role in the definition of the nominal interest rate and are divided into two categories of functions, following the rule applied by the FED before Volcker's appointment and Volcker's rule. Before the year 1979, the FED applies an increase in the nominal interest rate lower than the increase in inflation. In contrast, Volcker's rule provided for an increase in the actual and nominal interest rate in response to inflation increases and proved to be a good anti-inflation measure. The first rule, instead, gave rise to more macroeconomic instability, due to perhaps far too optimistic estimates of potential GDP or erroneous interpretations from the FED and economic analysts at that time regarding the dynamics of the inflation in relation to GDP. These rules are similar to the Taylor's Rule (Taylor, 1979), which used similar variables in its functions.

The studies of the certain Romanian researchers (Copaciu, Nalban, and Bulete, 2015 and 2016) describe the estimation of a model DSGE with partial influences from the euro coin, developed for the Romanian economy. The model is based on a small and open economy, which includes financial destabilization at labor market level, and the additional mechanisms that are later introduced refer to the partial influence of the euro coin in financial sector and the expansion of the external sector towards a model for two economies. In the event of a decrease in value of the national coin induced by a shock of sovereign risk premium, the GDP is reduced due to a contractionary balance effect more strongly relative to the impact of the expanding induced by means of trade balance. Since financial operations in foreign currency are carried out in euro, and trading with goods and services is done in euro and US dollars, external shocks have different effects on the internal Romanian economy, depending on origin (European Community or USA). That way, it is possible to measure the influence of diverging monetary policies of Central European Bank and FED on developing markets in the financial and trading sectors.

### 3. Methodologies

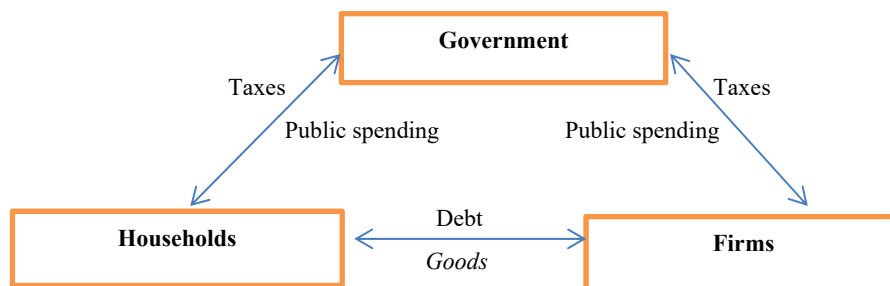
In this article, I have used a set of DSGE models and applied as a methodology the Blanchard-Kahn Technique, by using the MATLAB software and a reduced form of a code developed by the Bank of England, as presented in the practical work developed by Barnett and Ellison (2005). The data used are the structural parameters, presenting the situation of a Romanian economy, selected from specialized and reviewed literature. The whole of procedures used in this type of computing, whether the model is RBC or New Keynesian, it consists of 4 main steps always:

1. Model Calibration Stage
2. Linearization of the component equations of the model stage
3. State-space matrix formulation stage
4. Final stage, solving the equation system of the DSGE model

#### The DSGE MODEL

The model itself is a very simplified one, a modified version of the model described in the courses Practical DSGE Modeling (2005). Originally, it was used for a DSGE model with active monetary policy, a RBC model with Neo-Keynesian influences. I reconfigured the model, but also the Matlab code that was used, so that it includes the equations for households, businesses, but likewise the government's fiscal policy. Matlab is a program designed for multiple uses, which uses vector matrix calculations, scaling values and variables in the form of matrices.

**Figure 3.1.** *The DSGE Model*



#### Households

According to the National Institute of Statistics, a household consists of a group of two or more persons, who normally live together and are related, that share a common household, sometimes working together in the household, consume and share the products obtained, participate wholly or partially in the formation and use of the budget of household incomes and expenditures. The household can be composed of a group of two or more persons, with or without children, between which there are no kinship relations, but which declare that, by agreement, they live together and have a common budget.

People who live and farm themselves and who do not belong to another household are considered to be households consisting of one person.

In any economy there is a large but still finite number of households, and the behavior of households is to consume marketable goods and to offer labor force rendered at a cost, that feed the needs of a firm.

The household maximizes the present net value of the expected utility at the present moment to the infinite future and are subject to a budgetary constraint. Households are characterized by maximizing the utility by smoothing the level of private consumption. With the starting point of these attributes, I will build the form for the utility function, characteristic to households.

Firstly, the function of consumption utility has the following basic form:  $\frac{C^{1-\sigma}}{1-\sigma}$ , But since, unlike other consumer utility functions, the workforce is not taken into account, its value will be  $\sigma = 1$ . Additionally, the utility function CRRA (constant relative risk rainfall) tends towards the logarithm function, when the value of the coefficient of the rate of substitution of consumption ( $\sigma$ ) is 1.

The condition of maximizing consumption, from one period to another, will be derived and form that relationship:

$$\max U(C_0) + \beta U(C_1)$$

$$dU = 0 = U'(C_0) \times dC_0 + \beta U'(C_1) \times dC_1$$

$$\frac{dC_1}{dC_0} = -\beta \times \frac{U'(C_0)}{U'(C_1)}$$

where  $\beta_t$  is the discount factor applied to the consumption utility function and presents the small degree of uncertainty, but sure, correlated with the value of future consumption,  $C$  is the private consumption of households.  $\Sigma$  is, as I have said, the coefficient of elasticity of private consumption.

Smoothing the consumption level refers to the application of restrictions on the utility function. Starting from the original budget constraint for households, built with monetary elements, we reformulated the respective constraint equation so that the household model would be compatible with the tax policy model. The budgetary constraint, in its basic form, is represented in this form:

$$p_1 \times C_1 = (W_0 - p_0 C_0) \times (1 + r_0)$$

The monetary element in this relationship is the price associated with key variables: the private consumption of households and the workforce, together with which they form the gross salary. In order to rectify this fundamental influence of monetary policy and to highlight the importance of fiscal policy, the form of the equation will change as follows:

$$b_1 \times C_1 = (W_0 - b_0 \times C_0) \times (1 + g_0) \rightarrow$$

$$b_1 \times dC_1 = -b_0 C_0 \times (1 + g_0) \rightarrow$$

$$\frac{dC_1}{dC_0} = \frac{1+g_0}{1+b_1}$$

where  $b$  is the level of duty associated with consumption in each period and will take the place of the price, which means that, in the light of fiscal policy, each unit of good consumed has attached the promise of a debt to the government, not just a price, as specified in the case of an active monetary policy. In this case, I will treat fiscal policy as the only active policy of the state being analyzed;  $G$  represents the share of public spending in GDP and is one of the instruments of fiscal policy, another instrument being tax pressure, calculated as the share of taxes levied by the government in total GDP.

Like in the case of maximization of consumption, the equation shall be derived in order to obtain the above equality. Therefore, the following relationship will be obtained:

$$\beta \times \frac{U'(C_0)}{U'(C_1)} = \frac{1+g_0}{1+b_1}$$

This equality can then be transposed into the context of stochastic patterns, dynamic over time, bearing the name of the Euler equation of consumption, or the curve IS dynamic:

$$U'(C_t) = \beta \times E_t \times \left[ U'(C_{t+1}) \times \frac{1+g_0}{1+b_1} \right]$$

An increase in the level of public spending has a growth effect on GDP, but at the same time a long-term reduction in consumption. At equilibrium, the level of public expenditure is equal to the level of taxes collected. Even in the case of a budget deficit, an increase in the maximum ceiling for public spending is subject to increased tax levels. The increase in taxes levied, by increasing the statutory tax rates, restrict the consumption of goods. At the same time, an increase in debt weight will stimulate consumption, because both the population and businesses often use borrowing funds for consumption purposes, or to invest in various investment projects.

### Firms

Firms produce economic goods, based on their input elements, capital and labor, and therefore the activity can be replicated through a simple Cobb-Douglas utility function. These companies maximize their net up-to-date value, from one period to another, depending on the demand and supply curves and the rigidity of prices. Traditionally, the company's economic model would have this form:

$$Y = A \times f(K, L) = A \times K^\alpha \times L^{1-\alpha}$$

Coefficient **A** It is a shock of productivity and performs the shock role of the supply of goods. **Y** Is the GDP of the economy, **K** Is the capital invested in the production of economic goods, and **L** It's the workforce you filed. The coefficients of exponential  $\alpha$  and  $(1-\alpha)$  are the coefficient of elasticity of capital and labor. From this model you can deduce the main object of the companies, that of maximizing the profit, depending on the rigidity of the prices.

From the perspective of the active tax policy, I believe that the function of the utility should be amended, as in the case of an active monetary policy the function focuses on the labor component, creating an association between the concept of price and salary, which It can be interpreted as a labor price. From a tax point of view, it is possible to leave a part of the workforce, so that the function is based only on the invested capital and the shock of productivity.

$$Y = A \times f(K) = A \times K^\alpha$$

On the model of DSGE systems with active monetary policy, I will build the representative equation for firms with the help of a modified Calvo model of price stiffness. This model of type Calvo will be based, instead, on the rigidity of the debts. From the next chain series of equations, I will deduce the final form of the company model.

$$\begin{aligned}
 \hat{b}_t &= (1 - \omega) \times \hat{b}_{it} + \omega \times \hat{b}_{t+1} && \text{FISCAL CALVO MODEL} \\
 \downarrow \\
 \hat{b}_{it} &= (1 - \beta\omega) \times \hat{b}_t^* + \beta \times \omega \times E_t \hat{b}_{it+1} \\
 \downarrow \\
 \hat{b}_t^* &= \hat{b}_t + \hat{i} \\
 \downarrow \\
 \hat{i} &= \hat{k} \\
 \downarrow \\
 \hat{k}_t &= \frac{1}{\alpha} \times \hat{y}_t
 \end{aligned}$$

Normally within a model of type Calvo,  $\omega$  It would have been a coefficient for the level of price stiffness, but in this case it has the significance of the degree of rigidity of debts, as most firms are indebted to the purpose of continuing their economic activity. The coefficient is in reality the persistence of the debt variable, in an AR-type process (1). The equation shall then be divided into two separate parts: the variable part fixing the actual level of debt  $((1 - \omega) \times \hat{b}_{it})$  and the fixed part that remains rigid  $(\omega \times \hat{b}_{t+1})$ . A value  $\omega=0$  It would mean that the debts have a perfect flexibility, because the rigid component would be eliminated. The flexible part of the debt can be distinguished a potential debt value  $((1 - \beta\omega) \times \hat{b}_t^*)$ , Which is also flexible, and a future, expected and rigid value. The potential level of debt  $(\hat{b}_t^*)$  It is composed, in turn, of the estimated present value of the debts  $(\hat{b})$  and an additional investment cost  $(\hat{i})$ , What accumulates from one time to another. This investment cost is equal to the estimated value of capital at present time  $(\hat{k})$ , and the estimated capital is equal to an  $\alpha$  fraction of the value of the real GDP gap  $(\hat{y})$ . The  $\alpha$  parameter also represents the coefficient of elasticity of capital.

The stochastic form of the company model will be based on the previously built fiscal Calvo model:

$$\hat{y}_t = \frac{\alpha\omega}{(1 - \omega) \times (1 - \beta\omega)} \times (\hat{b}_t - E_t \times \hat{b}_{t+1})$$

This form also bears the name Phillips Keynesian curve, or the Philips foresight curve, where  $k = \frac{\alpha\omega}{(1 - \omega)(1 - \beta\omega)}$  It is an index that marks the degree of flexibility or stiffness of the debt. That index acts as a volatility in the difference, the gap, between the debt at present and future time. If the expected future value is higher than that present, then firms are likely to be more indebted to the present moment, with the hope that they will be able to diminish their debts in the future with the profits obtained using Currently borrowed capital. However, in this way, the level of indebtedness of firms often exceeds the threshold of sustainability, resulting in diminishing economic activity for the production of economic goods and services.

## Government

Normally, a government, as the central authority of an economy, operates over time with a mix of policies, consisting of monetary and fiscal policies, but in this situation we have opted to study the influences and The importance of the Romanian tax policy, using simplified terms and variables. Fiscal policy, as well as monetary, has the role of an optimal functioning guide, comprising its main objectives. These objectives will always be the stability of indebtedness, through a low debt level, and increased control of real production at the economy level, correlated with the growth rate of public spending, and implicitly of taxes and Tax collected by

the state. Following this reasoning, I considered it necessary to analyze only an active fiscal policy in exchange for an active monetary policy. At the moment, in Romania, fiscal policy plays a much more important role in balancing the economy than monetary policy.

### Monetary policy Model. Taylor's rule reaction function.

$$r_t = \rho_r \times (r_{t-1}) + (1 - \rho_r) \times [r^* + \rho_\pi \times (\pi_t - \pi^*) + \rho_y \times (y_t - y^*)] + \varepsilon_t$$

sau

$$r_t = \rho_r \times (r_{t-1}) + (1 - \rho_r) \times (r^* + \rho_\pi \times \hat{\pi} + \rho_y \times \hat{y}) + \varepsilon_t$$

where  $r_t$  is the nominal interest rate,  $\hat{\pi}$ ,  $\hat{y}$  Represents the inflation gap and the real production gap. From what you can see, the residual volatility parameter,  $\varepsilon_t$ , is, in reality, A shock of monetary policy. This reaction function bears the name of the function of the type Taylor rule. Taylor's rule regulates and optimizes the value of the dependent variable. The same rule also applies to active tax policy.

Fiscal policy generally uses 2 instruments, namely public spending and taxes. The fiscal policy tool used in this

### Fiscal policy Model. Taylor's rule reaction function.

$$g_t = \rho_g \times (g_{t-1}) + (1 - \rho_g) \times [r^* + \rho_b \times (b_t - b^*) + \rho_y \times (y_t - y^*)] + v_t$$

$$\tau_t = \rho_g \times (\tau_{t-1}) + (1 - \rho_g) \times [r^* + \rho_b \times (b_t - b^*) + \rho_y \times (y_t - y^*)] + v_t$$

$$g_t \cong \tau_t$$

where  $\tau_t$  is the fiscal pressure at the economy level,  $(b_t - b^*)$ ,  $(Y_t - Y^*)$  represents the public debt gap and the real GDP gap. In this case, residual volatility parameter,  $v_t$ , it's A shock of fiscal policy. The form I will adopt in calculating my study is much simplified to facilitate the faster calculation of equations. The function of public spending will react only to fluctuations in public debts and its size will be distorted by shock fiscal policy.

$$\hat{g}_t = \delta \times \hat{b}_t + \delta \times \hat{y}_t + v_t \longrightarrow \hat{g}_t = \delta \times \hat{b}_t + v_t$$

## 4. Results of the DSGE model

### 4.1. Calibration of the DSGE model

The calibration basis assumes that we must choose a list of initial values, a priori, data for the necessary parameters. These parameters are substantiated and tested values, proposed by various researchers in the literature, focused on macroeconomic stability. Research must also correspond to certain key features for the economic environment of the country being analyzed. Therefore, all parameters were selected from the research of Copaciu from 2015 and 2016. In this way, we no longer need to use statistical techniques to obtain parameter values, such as the Bayesian-type estimation, for their posterior values. This is the list of all necessary parameters:

**Table 4.1**

Description	Parameter	Values
Discount factor	$\beta$	0,9963
Capital elasticity coefficient	$\alpha$	0,55
The coefficient of elasticity of consumption	$\sigma$	1
Persistence (stiffness) coefficient of public debt	$\omega$	0,5
Autoregressive tax policy shock coefficient	$\varphi$	0,5
The Taylor rule coefficient for public debt	$\rho_b$	1,5



## 4.2. Model linearization

The forms of equations within the DSGE system present are non-linear and cannot be resolved in this form. Therefore, by using the properties of the natural logarithmic function (Ln) we can bring the equations in linear form, the final form being this:

$$\hat{y}_t = E_t \hat{y}_{t+1} - \sigma^{-1} \times (\hat{g}_t - E_t \hat{b}_{t+1}) \text{ (Household equation)}$$

$$\hat{b}_t = \beta \times E_t \hat{b}_{t+1} + k \times \hat{y}_t \text{ (Equation for firms)}$$

$$\hat{g}_t = \delta \times \hat{b}_t + v_t \text{ (Equation for fiscal policy)}$$

$$v_{t+1} = \rho \times v_t + \varepsilon_{t+1} \text{ (Autoregression process for fiscal policy shock)}$$

$$k = \frac{\alpha \omega}{(1 - \omega) \times (1 - \beta \omega)} \text{ (Equation for the stability of public debt)}$$

## 4.3. State space Matrix formation

Equations of balance of the DSGE model can be grouped into an equation system such as :

$$v_{t+1} = \rho \times v_t + \varepsilon_{t+1}$$

$$E_t \hat{y}_{t+1} + \sigma^{-1} \times E_t \hat{b}_{t+1} = \hat{y}_t + \sigma^{-1} \delta \hat{b}_t + \sigma^{-1} v_t$$

$$\beta \times E_t \hat{b}_{t+1} = -k \times \hat{y}_t + \hat{b}_t$$

Then the system of equations is presented as a matrix form of  $A_0 \times E_t Y_{t+1} = A_1 \times Y_t + B_0 \times v_{t+1}$

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & \sigma^{-1} \\ 0 & 0 & \beta \end{pmatrix} \begin{pmatrix} v_{t+1} \\ E_t \hat{y}_{t+1} \\ E_t \hat{b}_{t+1} \end{pmatrix} = \begin{pmatrix} \rho & 0 & 0 \\ \sigma^{-1} & 1 & \sigma^{-1} \delta \\ 0 & -k & 1 \end{pmatrix} \begin{pmatrix} v_t \\ \hat{y}_t \\ \hat{b}_t \end{pmatrix} + \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

## 4.4. The solution for the DSGE system of models

This section resolves the form of steady-states obtained. The technique used is Blanchard-Kahn. An alternative way to rewrite the matrix equation would be:

$$\left. \begin{array}{l} E_t Y_{t+1} = A_0^{-1} A_1 Y_t + A_0 B_0 v_{t+1} \\ A_0^{-1} A_1 = A \\ A_0 B_0 = B \end{array} \right\} E_t Y_{t+1} = A Y_t + B v_{t+1}$$

Next, I will partition the model by dividing the variable matrix X into variables with historical values ( $w_t$ ), predetermined and in variables with predicted values ( $x_t$ ), or variable control.

$$Y_t = \begin{bmatrix} w_t \\ y_t \end{bmatrix} \rightarrow \begin{bmatrix} w_t \\ E_t y_t \end{bmatrix} = A \times \begin{bmatrix} w_t \\ x_t \end{bmatrix} + B v_{t+1}$$

The new matrix A consists of the P matrix that contains the vectors of type Eigen (eigenvectors), the diagonal matrix containing the values of type Eigen (eigenvalues), called Lambda ( $\Lambda$ ), and the inverse of the matrix p. The procedure is named Jordan decomposition.

$$A = P \times \Lambda \times P^{-1}$$

The condition of the Blanchard-Kahn technique provides that the solution of the model with rational expectations is unique only if the number of unstable system solutions, in the form of Eigen vectors, is equal to the number of control variables, predicted.

If the stable roots are multiple, then we have multiple solutions and we cannot achieve a single balance and there is a need for alternative solution methods to be adopted. If unstable roots are multiple then there is not even a solution, there can be no question of balance. The Blanchard-Kahn condition is satisfied if there is only one solution, the balance path is unique and the system has dynamic stability.

$$\begin{bmatrix} w_t \\ E_t y_t \end{bmatrix} = P \times \Lambda \times P^{-1} \times \begin{bmatrix} w_t \\ x_t \end{bmatrix} + B \times v_{t+1} \rightarrow$$

$$P^{-1} \times \begin{bmatrix} w_t \\ E_t y_t \end{bmatrix} = \Lambda \times P^{-1} \times \begin{bmatrix} w_t \\ x_t \end{bmatrix} + P^{-1} \times B v_{t+1} \quad P^{-1} \times B = R \rightarrow$$

$$P^{-1} \times \begin{bmatrix} w_t \\ E_t x_t \end{bmatrix} = \Lambda \times P^{-1} \times \begin{bmatrix} w_t \\ x_t \end{bmatrix} + R \times v_{t+1}$$

For a system with three equations, the rule is that, according to the Blanchard-Kahn condition,  $w_t = u_T$  and that  $x_t$  to include  $y_t$  and

$$\Lambda = \begin{pmatrix} \Lambda_1 & 1 \\ 1 & \Lambda_2 \end{pmatrix} \quad P = \begin{pmatrix} P_{11}^* & P_{12}^* \\ P_{21}^* & P_{22}^* \end{pmatrix} \quad R = \begin{pmatrix} R_1 \\ R_2 \end{pmatrix}$$

The  $\Lambda$  matrix contains the Eigen values, the  $P$  matrix encompasses the formatting partitions

$$\underbrace{\begin{pmatrix} P_{11}^* & P_{12}^* \\ P_{21}^* & P_{22}^* \end{pmatrix} \times \begin{bmatrix} w_t \\ E_t x_t \end{bmatrix}}_{E_t \begin{bmatrix} \tilde{w}_{t+1} \\ \tilde{x}_{t+1} \end{bmatrix}} = \begin{pmatrix} \Lambda_1 & 1 \\ 1 & \Lambda_2 \end{pmatrix} \times \underbrace{\begin{pmatrix} P_{11}^* & P_{12}^* \\ P_{21}^* & P_{22}^* \end{pmatrix} \times \begin{bmatrix} w_t \\ x_t \end{bmatrix} + \begin{pmatrix} R_1 \\ R_2 \end{pmatrix} \times v_{t+1}}_{\begin{bmatrix} \tilde{w}_t \\ \tilde{x}_t \end{bmatrix}}$$

The whole idea is to convert and incorporate all the balance equations of the DSGE model into a single simple matrix equation, and then the matrix of solutions is divided into stable, historical values and unstable, predictive values.

$$\left. \begin{array}{l} P_{11}^* w_t + P_{12}^* x_t = \tilde{w}_t \\ P_{21}^* w_t + P_{22}^* x_t = \tilde{x}_t \end{array} \right\} \rightarrow E_t \begin{bmatrix} \tilde{w}_{t+1} \\ \tilde{x}_{t+1} \end{bmatrix} = \begin{pmatrix} \Lambda_1 & 1 \\ 1 & \Lambda_2 \end{pmatrix} \times \begin{bmatrix} \tilde{w}_t \\ \tilde{x}_t \end{bmatrix} + \begin{pmatrix} R_1 \\ R_2 \end{pmatrix} v_{t+1}$$

The last matrix equation will be disengaged in 2 linear equations, the next step being their resolution. The first equation is the equation of stable solutions, and the second is the equation of unstable solutions

$$\tilde{w}_{t+1} = \Lambda_1 \tilde{w}_t + R_1 v_{t+1} \quad \text{Equation of stable solutions}$$

$$\tilde{x}_{t+1} = \Lambda_2 \tilde{x}_t + R_2 v_{t+1} \quad \text{Equation of unstable solutions}$$

### Solving unstable Solutions

$$E_t \tilde{x}_{t+j} = (\Lambda_2)^j \tilde{x}_t \quad \text{Dacă } |\Lambda_2| > 1, \text{ Then all solutions are stable, which means that } \tilde{x}_t = 0$$

$$P_{21}^* w_t + P_{22}^* x_t = \tilde{x}_t = 0 \rightarrow x_t = -P_{22}^{*-1} P_{21}^* w_t$$

### Solving Stable Solutions

$$E_t \tilde{w}_{t+j} = (\Lambda_1)^j \times \tilde{w}_t$$

The matrix of coefficients is divided into partitions. These partitions and stable and unstable values form a new system of equations, which will be resolved through the Matlab program.

If 's the module of  $\Lambda_1$  is less than 1, there is no problem, it does not reduce the value of the solution.

$$\left. \begin{aligned} \tilde{w}_t &= P_{11}^* \times w_t + P_{12}^* \times y_t \\ y_t &= -P_{22}^{*-1} \times P_{21}^* \times w_t \end{aligned} \right\} \rightarrow \tilde{w}_t = (P_{11}^* - P_{12}^* \times P_{22}^{*-1} \times P_{21}^*) \times w_t$$

$$\tilde{w}_{t+1} = \Lambda_1 \times \tilde{w}_t + R_1 \times v_{t+1}$$

$$\tilde{w}_t = (P_{11}^* - P_{12}^* \times P_{22}^{*-1} \times P_{21}^*) \times w_t$$

$$(P_{11}^* - P_{12}^* \times P_{22}^{*-1} \times P_{21}^*) \times w_{t+1} = \tilde{w}_{t+1}$$

A recursive structure for stable and unstable solutions was obtained.

$$\tilde{x}_t = -P_{22}^{*-1} \times P_{21}^*$$

$$w_{t+1} = (P_{11}^* - P_{12}^* \times P_{22}^{*-1} \times P_{21}^*)^{-1} \times \Lambda_1 \times (P_{11}^* - P_{12}^* \times P_{22}^{*-1} \times P_{21}^*) \times w_t + (P_{11}^* - P_{12}^* \times P_{22}^{*-1} \times P_{21}^*)^{-1} \times R_1 \times \varepsilon_{t+1}$$

The final solution of the the equation system, obtained following the execution of the Matlab code, is an array with a matrix with 2 values, a value for the stable solution and a value for the unstable solution.

The stable solution obtained is the shock value of the fiscal policy applied to the model in the given situations.

## 5. Concluzii

The main objective of this work was achieved through the use and estimation of a DSGE model, composed of a system of representative equations for the economic agents involved in Romania. Literature on the use of DSGE models abounds with various specialists in the field, both at national and international level. The international plane comprises renowned authors over the decades, such as Taylor (1999), or Clarida, Gaults, Gertler (1998), or Blake and Markovic (2007), which laid the foundations for the construction of these typologies of models. Internally, Copaciu, Nalban and Bulete (2015.2016) have built, in the publications of the National Bank of Romania, a complex architecture of most domestic economic agents, through the perspective of dynamic models stochastic and VAR models. Contrary to methodologies and forms of equations used in literature, I used a simplified but effective methodology to highlight the role of fiscal policy in relation to other functions, called the Blanchard Kahn technique. This technique was described in the training courses of the Bank of England by Barnett and Ellison (2005). The whole idea is to convert and incorporate all the balance equations of the DSGE model into a single simple matrix equation, and then the matrix of solutions is divided into stable, historical values and unstable, predictive values. The matrix of coefficients is divided into partitions. These partitions and stable and unstable values form a new system of equations, which will be resolved through the Matlab software. The stable solution obtained is the shock value of the tax policy applied to the model in the given situations.

With regard to the new research prospects, on this path, the use of economic variables with real data, taken from databases such as Eurostat, is the immediate step necessary, as well as

changing the methodology used in solving solutions. The Bayesian estimation is the methodology most commonly used in solving DSGE models and it is preferable, since it has few limitations in relation to the data. The model will include in the future also a monetary policy, as well as other types of economic agents. The parallel use of VAR models (models with autoregressive vectors) is another viable option in determining macroeconomic stability. The research pathways are numerous and all must be exploited in order to make a balanced economic framework for Romania.

---

## References

---

- Anand, R., Peiris, S. and Saxegaard, M., 2010. An Estimated Model with Macrofinancial Linkages for India. *IMF Working Paper*, WP/10/21.
- Barnett, A. and Ellison, M., 2005. Practical DSGE Modelling. Bank of England.
- Blake, A. and Markovic, B., 2007. The conduct of global monetary policy and domestic stability: luck versus judgement. Presented at conference, *Working Paper*, No. 353, Bank of England,
- Cem, C., 2011. The Interactions Between Monetary and Fiscal Policies in Turkey: An estimated New Keynesian DSGE Model. *Working paper*, No. 11/04, Central Bank of the Republic of Turkey.
- Clarida, R., Gali, J. and Gertler, M., 1998. Macroeconomic Stability, Financial Stability, and Monetary Policy Rules. *NBER Working Paper Series*, No. 6442.
- Copaciu, M., Nalban, V. and Bulete, C., 2015. An estimated DSGE model for Romania. National Bank of Romania.
- Copaciu, M., Nalban, V. and Bulete, C., 2016. R.E.M. 2.0. Model DSGE cu euroizare parțială estimat pentru România, Banca Națională a României.
- Friedman, M. and Schwartz, A.J., 1963. A monetary history of the United States, 1867-1960. Princeton: Princeton University Press.
- Taylor, J., 1979, A Historical Analysis of Monetary Policy Rules, University of Chicago Press, Monetary Policy Rules, pp. 319-348.
- <[www.statistici.insse.ro](http://www.statistici.insse.ro)>
- <[www.ec.europa.eu/eurostat/data/database](http://www.ec.europa.eu/eurostat/data/database)>

# A new approach to corporate governance

**PhD Lecturer ANDREI STĂNCULESCU**  
The Bucharest University of Economic Studies  
The Faculty of Finance and Banking  
andrei.stanculesc@fin.ase.ro

**Abstract.** *This work emphasizes the need of a new paradigm in financial and corporate governance literature which would be based on the informational and "energy" exchanges that normally take place between the stakeholders of any corporation. Corporate governance is directly related to corporate finance, by definition. The main goal of any intellectual process that intends to express a general model of corporate finance will, firstly, have to go through corporate governance relationships and secondly, through a detailed emphasis of cash and "energy" flows. Thus, a new paradigm is required.*

**Keywords:** cash-flow, corporate governance, low entropy value theory, shareholders, stakeholders.

**JEL Classification:** G39.

## The argument

As we have shown in a previous work, the role of the employees in the corporate governance system should be greatly enhanced considering that this particular group is responsible for the genuine value creation that occurs inside any company<sup>(1)</sup>. Therefore, the co-determination model, which emphasizes the employees as a specific level of governance, is suitable to describe the most appropriate corporate governance solution within an enterprise. But we would like to take this even further, to the development of a potential new model.

Considering recent developments of corporate governance mechanisms and based on human common sense, one would have to base any governance model on several cornerstone principles. Here are these principles stated and explained, based on our personal expertise in the field, and, most importantly, common sense and logic:

- corporate governance relationships must be highly detailed, by law, in detail;
- employees should play the central role in corporate governance;
- benefits should be distributed according to "energy" flows;
- cash-flows should follow the "energy" flows;
- corporate governance research should focus mainly on cash-flow.

## The proposed principles

To discuss the first principle, one may need a detailed study on labor legislation, which may differ from country to country. Then proper measures should be taken in order to adjust law or custom<sup>(2)</sup>, so it may accurately describe corporate governance relationships, that exist between all corporate stakeholders. Thus, all *corporate governance relationships must be highly detailed, by labor law*. This would also imply restricting the liberties of a corporation, and the manner in which business is generally conducted. But the final outcome of this endeavor would be extremely valuable, as corporations would be subject to better controlling, as far as the government and the citizens are concerned.

The second governance principle requires that *employees play the central role in corporate governance*. Yes; according to previous arguments that we had brought, employees (managers, workers, staff, etc.) constitute the life force of a company. They produce the value added, from inside the corporation. Any governance model should place these employees in the center of the paradigm. In our opinion, any serious researcher should challenge the current model (or paradigm) because it fails to emphasize the importance of a crucial stakeholder category - namely, the one which is responsible for creating the value of the company and for driving the "engine" of a corporation. The co-determination model may be a useful starting point, but the paradigm shift should not stop here. It should only start at this point. Shareholders play an important role, but a secondary one, in our opinion.

According to the third corporate governance principle that we propose, the corporate benefits must replicate the path of the effective "energy" that has been consumed inside the corporation. Useful, at this point, would be to approach value by the EVT method<sup>(3)</sup>. This abbreviation stands for "low entropy value theory", developed by a reputed researcher. The content of this theory generally states that value should be approached in a wider context, by applying interdisciplinary relationships, which are strongly correlated with the spectrum of natural laws. By this approach, at the foundation of corporate value we should place the physical support of matter which may take three forms: *substance, information and energy*, which in fact define low entropy. Thus, in this system of low entropy, business and finance happen. Then, as corporate governance is strongly related to corporate finance, one should try to identify all correlations to governance, and the financial outcome of governance. But, very simple logical reasoning requires that *financial benefits should be distributed according to "energy" flows*. By benefits, we refer to revenue, profit, cash-flow and **static** cash from accounts. "Energy" is provided by employees. This is the work "invested". And this turns into cash-flow. Shareholders provide only **static** capital, which does not actually turn into "energy"<sup>(4)</sup>. It only acts as a temporary "incentive", which initiates the business cycle.

The fourth principle states that *cash-flows should follow the "energy" flows*. In our opinion, this is entirely true. Firstly, there is this solid financial indicator which is the cash-flow, by which corporate finance should be conducted more often. It actually shows the amount of cash which is brought into a company's treasury and bank accounts. This money flow turns (conventionally) into profit, thus influencing the shareholder cash-flow for the subsequent year. But this is not consistent to the "energy" flow, considering the latter is provided by the employees. Therefore, secondly, corporate governance, by law, should state that any cash-flow (and mainly remuneration cash-flow) be correlated to any "energy" flow - which is generally provided by work/labor. So, it would be more logical that shareholders hold the residual interest in **cash-flow**, as they do in the **static** cash/assets, after deducting liabilities. Wouldn't it be more appropriate? By this new approach, we suggest that employees/personnel be paid by a total cash-flow which is at least comparable in value to the shareholder cash-flow.

The fifth and last proposed governance principle is focused on the financial, namely cash-flow relations that occur during the progress of any internal activity, which is of course based on the corporate governance framework. From the monetary point of view, cash-flow would be the most relevant financial indicator; it is comprised of three main elements<sup>(5)</sup>: operating cash-flow, investment cash-flow and financing cash-flow. These monetary flows should be privileged in financial analysis, because they bring more information as compared to net income (profit), earnings before taxes<sup>(6)</sup> or any financially computed return. Therefore we consider *corporate governance research should focus mainly on cash-flow*. The future research materials should: emphasize the importance of cash-flow; identify the corporate governance relationships in any corporation; schematize these relationships and the cash-flow associated with them and verify if these cash-flows follow the "energy" flows. To this respect, research studies should not lack the EVT method. They should in fact apply it.

Obviously, taking these principles in consideration would imply a big paradigm shift in corporate finance, and corporate governance. The main objective of corporate finance can no longer be "maximization of shareholder wealth". It would violate principles four and five (in order of presentation). Corporate law would need intense adjustments. Research work will have to be deferred; or shifted to accommodate the central stakeholders - the employees. We strongly believe it is time the research community challenges the old corporate governance models and creates the appropriate context for a new scientific paradigm, which is based on: interdisciplinary approaches, logic and common sense, actual human abilities, actual money flows and the correct viable potential of human resources.

### The solutions

Building solutions to this present situation will be a complicated endeavor. This is mainly because these new proposed principles require modifying the existing legislation regarding labor, corporations, taxes. The solutions would imply:

- attributing the central role in corporate governance to employees;
- measuring the macroeconomic implications of this profound paradigm shift in corporate microeconomics;
- implementing taxation on corporate cash-flow;
- introducing a new accounting measurement for the "energy" spent by the human resources.

### Discussing the solutions

Well, firstly, the legislator should *attribute the central role in corporate governance to employees*. This is obviously because these stakeholders are the ones that produce the value added within a company, therefore pure human logic requires they are given the central role in the governance of a company. Supplemental legal protection should be offered to any current or potential employee, while dealing with a corporation, from the economic circuit.

Secondly, the government must deploy measures in order to assess *macroeconomic implications of this profound paradigm shift in microeconomics*. From economic decision to political decision there is only one step. But how big of a step is needed and how long will it take to succeed, and with what amounts of human, material and financial efforts, only history will be able to tell us<sup>(7)</sup>. Discriminating between economic and political factors, during this process, is difficult to achieve because in practice they are inseparable.

Thirdly, the state would need to *implement taxation on corporate cash-flow*. Even though this may sound absurd or impossible for any practitioner, occasionally there comes a time when the given paradigm needs to be thoroughly scrutinized and challenged by anybody capable of simple deductive reasoning and innate human logic. By taxing cash-flow, taxation would be linked to the actual monetary source of the corporate revenues; in addition, corporations will have to use cash-flow, which is correlated to the "energy" flow.

Fourthly, these changes must be reflected by accounting law, methods, instruments, etc. Therefore, a *new accounting measurement is necessary to quantify the "energy" spent by the human resources*. This a difficult objective to achieve. The double-entry bookkeeping system would be put to a very serious test, in order to quantify "energy", which should be directly related to the total corporate cash-flow. Cash-flow is "energy", from our view-point. To make this happen, all corporate governance systems should function as "rules-based" systems<sup>(8)</sup>. Rules should be very strict. Cash-flow would need to be very carefully measured, computed, recorded and estimated, because this financial indicator will be the "key" in measuring the "energy". How exactly will this measurement be operated, we can only speculate for now, but the conceptualization is this.

To conclude, this paper argued for an alternative approach in corporate governance. This new proposed corporate governance model would imply an extreme paradigm shift in financial theory, practice, thought, etc. But we stand by our argued opinion. We stand by it because we consider it to be correct. Even though it is not agreed upon by the majority of researchers and practitioners. Nevertheless, by using the human common sense and simple deductive reasoning, which were also used as argumentation tools in this paper, one can come to the simple conclusion that majority does not always equate to the truth of the matter.

---

## Notes

- (1) Stănculescu, A.; Mitrică, E.; "Discussing three pillars of corporate governance", *Theoretical and Applied Economics (supplement)*, pg. 93-96, 2015
- (2) The Bucharest Stock Exchange *Corporate Governance Code* (online)
- (3) Bran, P.; *Finanțele întreprinderii*, Editura Economică, București, pg. 15, 2003
- (4) Inverted commas are used to emphasize the idea that "energy" is a term imported from natural sciences
- (5) Stancu, I.; Stancu, D.; *Finanțe corporative cu Excel*, Editura Economică, București, pg. 343, 2012
- (6) Stancu, I. (coord.); *Finanțe (vol. III). Gestiunea financiară a întreprinderii*, Editura Economică, București, pg. 70, 2003
- (7) Roman, D.; *Finanțe publice internaționale*, Editura Economică, București, pg. 35, 2003
- (8) [www.acowntancy.com](http://www.acowntancy.com)

---

## References

- Bran, P., 2003. *Finanțele întreprinderii*, Editura Economică, București.
- Roman, D., 2003. *Finanțe publice internaționale*, Editura Economică, București.
- Stancu, I. (coord.), 2003. *Finanțe (vol. III). Gestiunea financiară a întreprinderii*, Editura Economică, București.
- Stancu, I. and Stancu, D., 2012. *Finanțe corporative cu Excel*, Editura Economică, București.
- Stănculescu, A. and Mitrică, E., 2015. Discussing three pillars of corporate governance, *Theoretical and Applied Economics (supplement)*, pp. 93-96.
- <[www.acowntancy.com](http://www.acowntancy.com)>
- <[www.bvb.ro](http://www.bvb.ro)> Bursa de Valori București - *Codul de Guvernanță Corporativă*



# Bancassurance – one of the most important distribution channels in Europe

**Elda MARZAI (ABLIZ)**

The Bucharest University of Economic Studies, Bucharest, Romania  
elda.abliz@yahoo.com

**Abstract.** *During the financial crisis, most of the financial institutions are trying to improve new products and services for generate new revenues. So, the implementation of bancassurance activity in the banking field contributes to strengthening of the competitive environment, developing new products in insurance and satisfying the customers' needs in one financial institution.*

*This paper aims to highlight different perspectives about bancassurance concept, history and development in this period full of changes and the identification of main strengths, weaknesses, opportunities and threats which contributing to the sustainability of bancassurance. In addition, will be presented a situation regarding bancassurance development in Romania.*

**Keywords:** bancassurance, insurance, banking, gross written premiums.

**JEL Classification:** G29.

## Introduction

The development of financial markets and the increasing importance of banks in the economic and financial environment led to their specialization and the diversification of banking services and products. Thus, banks have also accessed capital markets in competition with securities, insurance, mutual funds and pension funds. The competitive pressure from other financial market segments (such as insurance and capital markets) has prompted banks to initiate and develop new services such as Bancassurance.

Bancassurance is an arrangement in which a bank and an insurance company form a partnership so that the insurance company can sell its products to the bank's client base. This partnership arrangement can be profitable for both companies. Banks can earn additional revenue by selling the insurance products, while insurance companies are able to expand their customer bases without having to expand their sales forces or pay commissions to insurance agents or brokers.

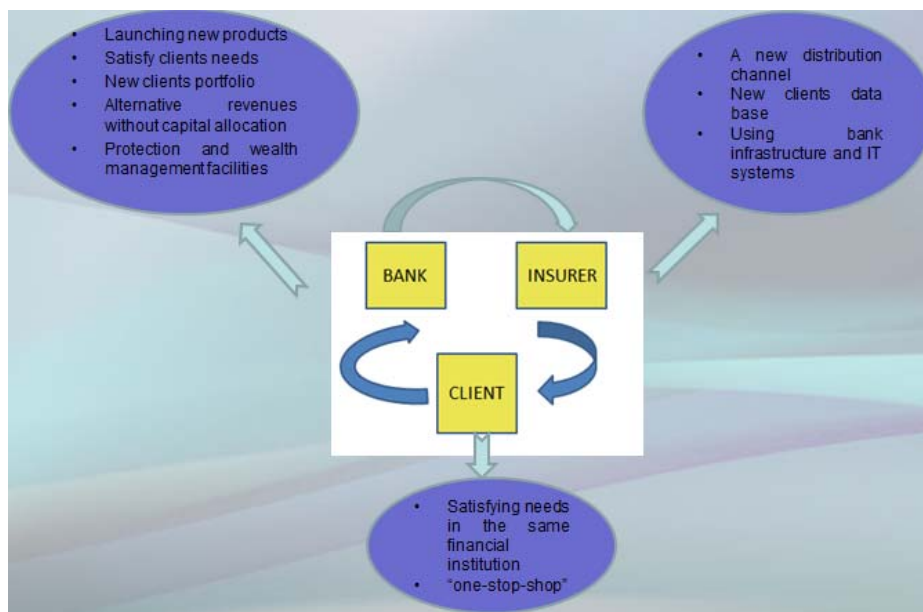
Bancassurance is an insurance brokerage activity that is complementary to the products of credit institutions and non-banking financial institutions, carried out through the network of these institutions (law no. 32/2000).

The development of bancassurance can be divided into three stages. In the first stage, until 1980, banks were selling guaranties as insurance in the form of direct extension of their banking activities. This service was not of selling insurance, as it is offered now days, therefore this period can be named as a period where bankers did not sell insurance but they acquired experience in this field. The second development phase began after 1980, when banks started offering services in the field of insurance to their clients. First sale of Life insurance by banks was made in France. After that, during late 80's unit linked and investment linked policies were sold in developed European Countries. In the third phase, which began in 1990, banks started selling non-life insurance services too, along with life insurance policies (Krstic et al., 2011).

The Bancassurance models may be 'Integrated models' which is insurance activity deeply integrated with bank's processes. Premium is usually collected by the bank, usually direct debit from customer's account held in that bank. New business data entry is done in the bank branches and workflows between the bank and the insurance companies are automated. In most cases, asset management is done by the bank's asset management subsidiary. Insurance products are distributed by branch staff, which is sometimes supported by specialized insurance advisers for more sophisticated products or for certain types of clients. Life insurance products are fully integrated in the bank's range of savings and investment products and the trend is for branch staff to sell a growing number of insurance products that are becoming farther removed from its core business, e.g., protection, health, or non-life products. Bank branches receive commissions for the sale of life insurance products. Part of the commissions can be paid to branch staff as commissions or bonuses based on the achievement of sales targets.

Also, 'Non-integrated Models' – The sale of life insurance products by branch staff has been limited by regulatory constraints since most investment-based products can only be sold by authorized financial advisers who have obtained a minimum qualification. Banks have therefore set up networks of financial advisers authorized to sell regulated insurance products. They usually operate as tied agents and sell exclusively the products manufactured by the bank's in-house insurance company or its third-party provider(s).

In many countries, the choice of a business model is influenced by regulatory constraints (e.g., the minimum qualification required to sell insurance products, the type of products that banks are allowed to sell, or the nature of the relationship between banks and insurance companies).



Source: Author's

According to the definition of the Center for Insurance & Financial planning, “Bancassurance assume a wide range of detailed arrangements between banks and insurance companies, but in all cases, it includes the provision of insurance and banking products or services from the same sources or to the same customer base”.

### The Legal Framework

The legal framework for bancassurance and the authorities' attitude to its development are clearly essential and have a real influence on the model's conditions for success in a given country.

In Europe, there are no limitations in place on Bancassurance models, point-of-sales approaches, or products that may be sold through banks.

The Insurance Distribution Directive ("IDD") fully recasts the Insurance Mediation Directive ("IMD"), and introduces several significant changes and challenges, to the whole insurance distribution eco-system. (Directive (EU) 2016/97 of the European Parliament and of the Council, on insurance distribution.

Like its predecessor, the IDD is a 'minimum harmonizing' directive and member states will be able to 'gold-plate' it by adding extra requirements to it when implementing it. That said, the IDD is intended to significantly raise the minimum standards of the IMD. On cross-border trade in particular, the introductory wording to the IDD refers to the fact that the European insurance market remains very fragmented despite the existing single 'passport' systems for insurers and intermediaries.

It came into force on 22 February 2016 and updates the 2002 Insurance Mediation Directive (IMD), which set out a framework for regulating EU insurance brokers, agents and other intermediaries. Member states have two years to transpose the IDD into national laws and regulations, ie before 23 February 2018 on which date it will repeal the IMD.

An integral part of regulatory changes impacting the financial services industry (e.g. PRIIPs, MiFID), the IDD will require all actors involved in the manufacturing and /or distribution of insurance products to review their business strategy, adapt their organization, as well as rethink their future interactions.

This Directive is aimed at minimum harmonization and should therefore not preclude Member States from maintaining or introducing more stringent provisions in order to protect customers, provided that such provisions are consistent with Union law, including this Directive.

Various types of persons or institutions, such as agents, brokers and 'bancassurance' operators, insurance undertakings, travel agents and car rental companies can distribute insurance products. Equality of treatment between operators and customer protection requires that all those persons or institutions be covered by this Directive.

Consumers should benefit from the same level of protection despite the differences between distribution channels. In order to guarantee that the same level of protection applies and that the consumer can benefit from comparable standards, in particular in the area of the disclosure of information, a level playing field between distributors is essential.

### Extension of scope

Where the existing IMD applies to the regulation of insurance intermediaries, the new IDD applies to the wider regulation of insurance 'distributors'. This means that it applies to:

- all sellers of insurance products, including insurance undertakings that sell directly to customers: currently, the IMD applies to insurance intermediaries only. However, in order to level the playing field between direct and intermediated sales, the new directive applies to all sellers of insurance products including those that sell directly to customers. This reportedly results in the IDD covering about 98% of the market, compared to about 48% of the market covered by the IMD. In the UK, the change will not significantly impact the market due to 'gold-plating' of the IMD - however, the new directive does contain specific information provisions that may add cost and complexity to insurers' direct sales processes.
- any person whose activities consist of assisting in the administration and performance of insurance contracts, including those acting on behalf of insurers - for example, claims management activities: currently, the IMD only covers those acting on behalf of the policyholder. However, the new directive extends its application more widely to others who assist in the administration and performance of insurance contracts - for example, in the event of a claim. This may improve service provision for insurers as such firms will have better controls in place, but additional costs may be passed onto insurers. Firms will need to confirm that all such entities that they do business with are properly authorised and that their contractual arrangements reflect the change in regulation. Notably, the management of claims of an insurer/reinsurer on a professional basis, loss adjusting and expert appraisal of claims have been 'carved out' of the extended definition.
- ancillary insurance intermediaries: the scope of the new directive has also been extended to include 'ancillary' insurance intermediaries, although a lighter touch regime will apply and member states are entitled to require that insurers and intermediaries take greater responsibility for ancillary intermediaries. Ancillary intermediaries must meet three conditions to avoid full regulation, including that the insurance products concerned must not cover life assurance or liability risks unless that cover complements the product or service which the intermediary provides as his principal professional activity.

Amongst other things, the new regime provides that when an insurance product is offered together with another service or in a package or as a condition for the same agreement or package, the insurance distributor must inform the customer whether it is possible to buy the different components separately. If so, it must provide an adequate description of the different components of the agreement or package as well as separate evidence of the costs and charges of each component.

In France, the Bancassurance channel was introduced in 1980. The regulator exercises regular monitoring. Banks act as brokers for distribution of life insurance products.

In United Kingdom, the sale of insurance through banks was initiated in 2001. The sale of life insurance products by bank staff has been limited by regulatory constraints since authorized financial advisers who have obtained a minimum qualification can only sell most Investment-based products. Following the reform of the polarization regime, banks will have the possibility to become multi-tied distributors offering a range of products from different providers. (Source: Report of the Committee on Bancassurance, IRDA, 2011) In view of the implementation of the bancassurance activity, some theories are based. The most important are:

- Insurance sales costs are substantially reduced when policies are cross-sold to a bank customer base (Nicholson, 1990)
- Selling insurance products implies that the own customer base of each bank will be better protected against competition from other banks (OECD, 1993, p. 47)

Certain bank and insurance services are joint products and cannot be obtained separately. In other words, they form “tie-in-sales” (OECD, 1992). However, to be sold in banks, most insurance products have to have their own advantages. They have to be standardized and thus at low costs. They may be produced by a subsidiary to the bank and thus treated as an in-house product. This makes it easier for them to be sold through ordinary distribution channels (OECD, 1992, sections 23, 54, 64, 68).

### Implementation of Bancassurance Advantages and Challenges

Bancassurance carries important distributional advantages over traditional insurance agency networks. However, in an age in which insurance is frequently sold via the Internet or via the telephone, the earlier distributional efficiencies that helped Bancassurance develop in some countries are not so clear.

One critical advantage held by the Bancassurance model is that the insurance is often a minor add-in cost when viewed as part of a much larger economic transaction. So the decision to take it (or not) is a relatively simple one. If the customer is taking out a loan that will run for perhaps 25 years, the insurance that helps make the transaction work may be only a small fraction of the interest payments.

Also, using the branding of a bank is comfortable and will offer credibility to the insurance product.

Third, a key advantage is seen from a customer sales opportunity perspective.

Extending this is the transactional data advantage that a bank enjoys with the benefit of its prior knowledge of already knowing its customer. In some jurisdictions the use of such information is strictly controlled.

A fourth advantage held by the Bancassurer is the ability to control the renewal process. This can easily act to the significant disadvantage of the consumer (a point discussed below under Regulatory Issues for Banks). From the bank’s point of view, however, it may be dynamically important that the borrower maintains proper insurance in relation to the loan—whether that be the Property insurance where the loan is secured by a title to property, or Life insurance in regard to the securing of the income stream intended to repay the mortgage, or otherwise.

An additional issue here is that the longevity of the insurance is of general assistance to the wider process of communicating to the community the value created by insurance. The borrower who perhaps at first did not understand the details too clearly will quite possibly notice the annual deductions for the cost of insurance and ask in more detail about why the insurance remains part of the loan agreement. The more that occasions like this arise, when the general public attains greater appreciation of the purpose and value of buying insurance, the more effectively these issues will be accepted by the wider community.

### Distribution Disadvantages

In contrast to the five points mentioned above favoring Bancassurance as a distribution mechanism, numerous negative issues point to limitations for Bancassurance.

In the literature there is a whole debate about the focus of companies involved in conglomerates creating or destroying value. In early literature (Lang and Stulz (1994), Berger and Ofek (1995), Servaes (1996), have shown that firms involved in multiple activities are less valuable. Leaven and Levine (2007) showed strong evidence to reduce the value of conglomerates, using data from 836 banks in 43 countries. They analyzed banks' bank balances taken from BankScope for various activities and compared the Tobin indicator for all the analyzed banks (Market Value of Capital / Replacement Capital). They attributed the destruction of value to the problems of agencies with the conglomerate structure.

One problem is undoubtedly that the training of sales personnel is a complex and expensive process. Banks certainly have to give careful thought to the cost of training the sales personnel, which can never be as cost efficient as, for example, an Internet program can be. This is the principal reason why success in Bancassurance has been mainly limited to Life and Property products.

A second lies in the motivation of sales personnel.

A third and structural point is that the —key moment in Bancassurance comes at the key moment when (for example) the loan is sold. Once the customer checks the value-for-money of the product and decides that a superior—or at least a cheaper—product can be purchased elsewhere, almost no chance remains to recover the customer's business. This lies in sharp contrast to the Internet search engine business model, when each year the search engine can test the market and offer the customer whatever is the most recent and most attractive alternative.

In the end it is the cost ratio that counts over the long term. Bancassurance generally has cheaper cost ratios than almost all traditional agency-based sales processes. It is less competitive than the most modern Internet-based alternatives.

### SWOT analysis of bancassurance

Every development that is invented or created has strengths, weaknesses, opportunities and threats for further advancement. Banking has less risks than insurance thus it is essential to carry out a SWOT analysis on the interaction between the two sectors.

#### Strengths

The advantages that bancassurance has over other distribution channels as pointed out by Gonulal, Goulder & Lester (2012) include:

##### i. Gaining of efficiencies in the administration

Bancassurance is an additional product to the banks in increasing profitability. Banks have an advantage since they can exploit the services of the current employees to sell the insurance products by training them. Rajasekar and Kumar (2014) supports the assertion that the bank's trained staff, its brand name and the confidence and reliability of the bank's customers boosts the sale of insurance products.

##### ii. Capital advantages through diversification of risks

Banks offer a wide variety of services. They can diversify their risks in various sectors of their operations such as the financial sector and the insurance sector. This builds a high credibility and trust in their services and customers will have more confidence in them.

### iii. Arbitrage opportunities.

It enables the bank to have competitive advantage over competitors. Teunissen (2008) explains that banks have an advantage in liquidity, lending and investing services. The benefit from the visibility and convenience of their branch networks gives them an edge over other distribution channels of insurance.

Among other strengths that Rajasekar and Kumar (2014) outlines include their large customer base which they can sell the products to them. Banks understand the psychology of their customers as they interact with them on a regular basis. They can design products that suits their needs. Banks have a large and massive scale because they enjoy a wide network of branches even in rural areas.

### **Weaknesses**

Just like all institutions, banks have weaknesses that affect their operations and hinders progressive growth. Insurance product design can be a weakness to a bank. A poorly packaged product can damage a firm's brand.

Rajasekar & Kumari (2014) outlined the weaknesses faced by banks. There is lack of an IT culture in all future corporations and the internet connections are not properly provided to the staff. Most bank employees have no understanding of the insurance products. The bank staff have to undergo a certain minimum period of training and have a test to get them licensed. Also, there is lack of personalized services since the bank employees cannot offer during and after the sales service due to uncertainty.

### **Opportunities**

Bancassurance is an opportunity in itself in increasing insurance penetration in the economy. There also exist opportunities for bancassurers to exploit in order to increase their profitability as well as insurance penetration. Gonulal, Goulder & Lester (2012) identifies the opportunities which include: delivery of after-sales services and increasing customer loyalty and lifetime value. A well-designed insurance product will attract more customers and offering free additional services to clients boost their morale and encourages them to try out the products designed for them. Rajasekar & Kumari (2014) agree that opportunities exist for bancassurers. Many people in diverse areas need information about insurance and banks can use their networks in all branches to sensitize them. Also, the bank has a large database. It can group customers in a homogeneous manner so as to provide them with products that meet their needs.

According to Gonulal, Goulder & Lester (2012), life insurance can be used to eliminate the hazards of both secure and unsecure lending. As the bank issue a loan, it can insure the loan against risk of default of the borrower in case of death. For instance, if the borrower purchases a house using the loan, the dependents will be affected by the uncleared loan since the house acts as security for the loan. The bank may have to take ownership of the house and auction it in order to gain back the loan money. The life insurance package will thus completely repay the debt if it had been taken.

Under property and motor insurance, Gonulal, Goulder & Lester (2012) explain how the opportunities can be exploited. Property insurance insure against economic hazards affecting each property especially from concerns on continuing loan repayment or risk of damage of the security. For instance, a house purchased using the bank loan or a property acting as a security to the loan may be damaged due to theft, natural disasters or fire. This will be a loss both to the bank and the borrower. The bank can recover its liability through the insurance cover. Motor insurance apply to a car loan. Since the value of a motor depreciates quickly and its location is not fixed, the bank may insure the car and reduce the loan term to ensure the car's value is not too low.

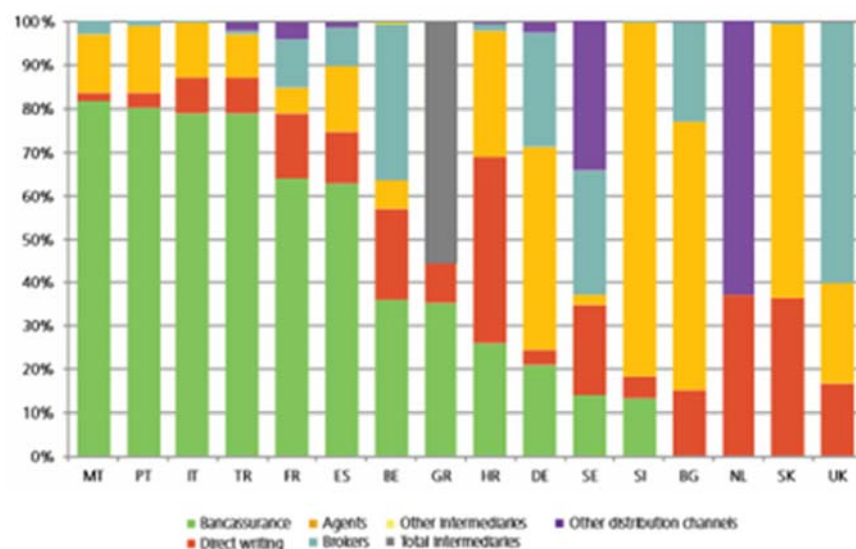
## Threats

The main challenges may arise due to conflict with insurance companies and also regulation issues may restrict their full participation in selling all insurance products. Competition is a main threat to bancassurers. The customers might not be willing to buy the products due to high costs or they may lack an understanding of the products work. Insurance companies may not be receptive of the new entrants (banks) into the insurance arena.

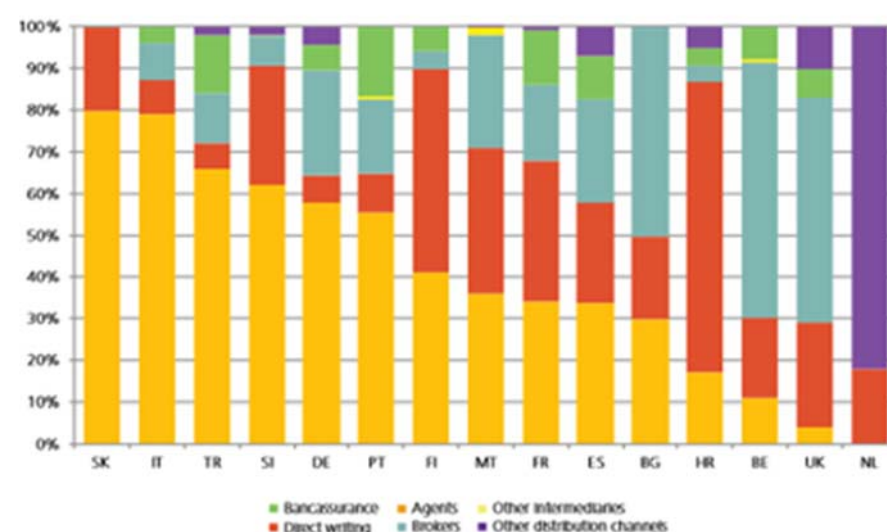
In addition to reputational contagion, poor manpower management and non-response from targeted customers is a huge threat. The lack of insurance knowledge by employees prevents them from convincing customers to purchase the product.

Bancassurance distribution represents a future solution and will continue to develop on the Romanian market. Bancassurance is the main channel of distribution in many countries, accounting for more than 50% of life insurance products (eg France, Italy, Spain, Austria) and in Portugal the share rises even over 80%. For Romania, there are no accurate studies on bancassurance distribution, but ASF estimates that it has a share of about 30% of gross premiums written on the life insurance segment below the European average.

Life distribution channels by country (% of GWP) — 2014



Non-life distribution channels by country (% of GWP) — 2014



Source: European Insurance in figures, available online

<https://www.insuranceeurope.eu/sites/default/files/attachments/EuropeanInsuranceKeyFactsAugust2016.pdf>



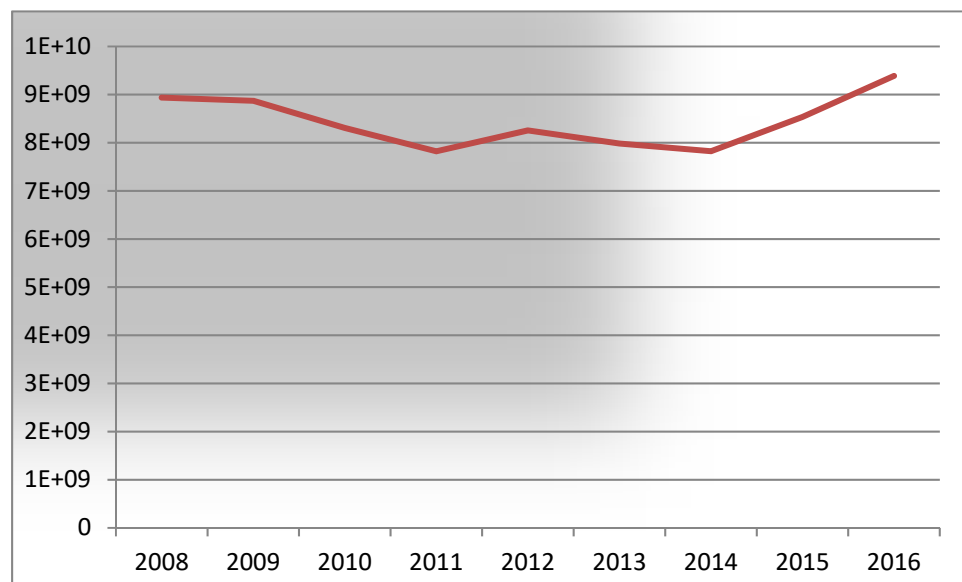
### Bancassurance in Romania

In Romania, the insurance activity is regulated by The Financial Supervisory Authority, as the competent national authority for regulating and supervising the capital market operations in Romania, with responsibilities in the field of consumer protection of non-bank financial services. Starting from January 3, 2018, Regulation (EU) no. 600/2014 on markets in financial instruments and amending Regulation (EU) No. (EC) No 648/2012 (MiFIR) and the European direct applicability regulations issued pursuant to Directive 2014/65 / EU of the European Parliament and of the Council on markets in financial instruments and amending Directive 2002/92 / EC and Directive 2011/61 / EU (MiFID II), which will ensure a much safer, fair and efficient operation of European capital markets, while providing greater transparency for all market participants.

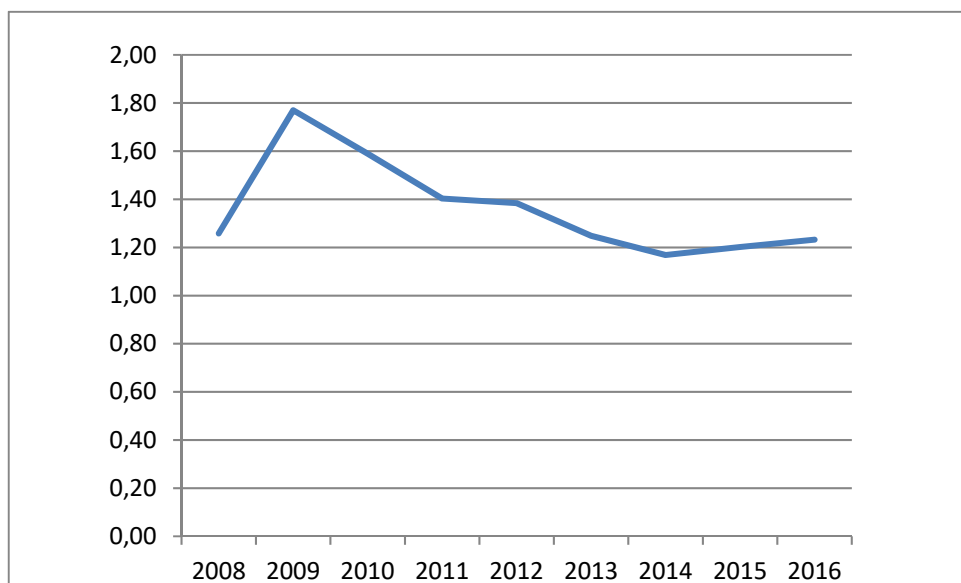
At the moment, there is no regulation just for bancassurance activity. Bancassurance insurance distribution represents a future solution and will continue to develop on the Romanian market. Bancassurance is the main channel of distribution in many countries, accounting for more than 50% of life insurance products (eg France, Italy, Spain, Austria), and in Portugal the share rises even over 80%. For Romania, there are no accurate studies on bancassurance distribution, but ASF estimates that it has a share of about 30% of gross premiums written on the life insurance segment below the European average.

The first bancassurance product in Romania was launched in 2001 by BRD and Aviva Life insurance (taken over in the meantime by Metropolitan Life, formerly Alico Asigurari). Since then, banks have turned into a crisis in one of the main channels through which life insurance is being sold, with the bancassurance channel contributing over 25% to insurers' businesses.

*Evolution of gross written premiums in period 2008-2016*



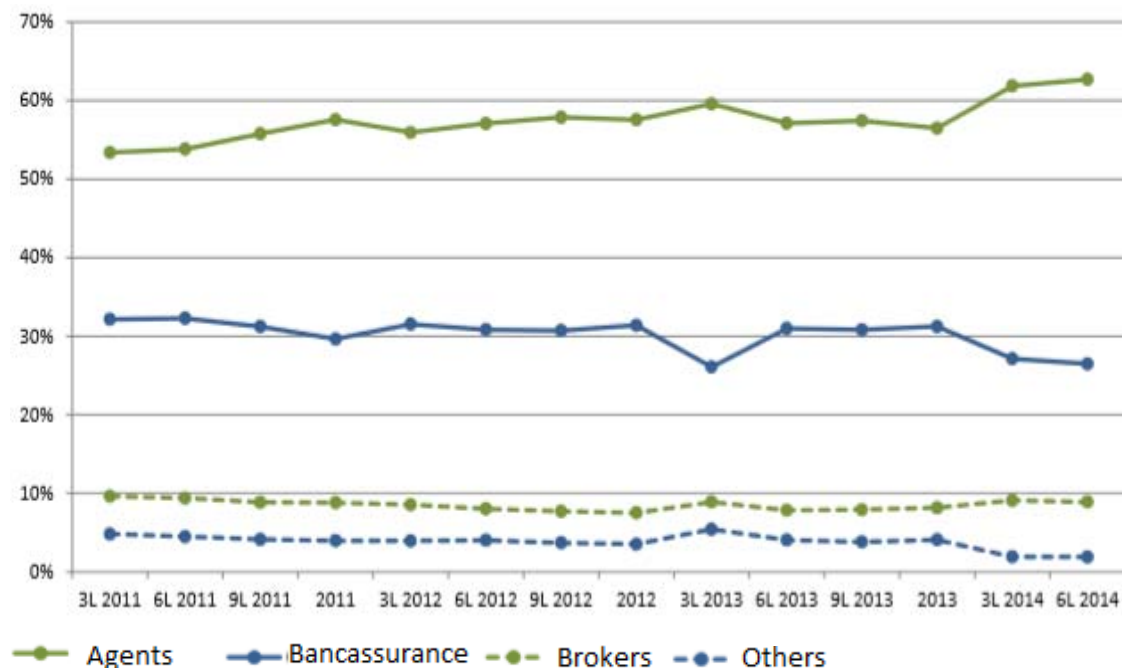
**Source:** Author's own based on annual reports of The Financial Supervisory Authority (ASF) data

*Evolution of insurance penetration in GDP*

**Source:** Author's own based on annual reports of The Financial Supervisory Authority (ASF) data

Figure on the next page shows the quarterly evolution of the share of each distribution channel over the period 2011-2014 from the PBS perspective. The data are presented in the manner set out in this study, namely aggregates at three months, six months, nine months and the full year, and refer only to life assurance itself.

The chart shows that, at the level of the whole sector, insurance agents are the main distribution channel of life insurance itself. Moreover, underwritings through agents have grown relative to other channels, with their share rising from around 53% in early 2011 to around 63% in the middle of 2014.



**Source:** Consiliul Concurentei, [https://www.juridice.ro/wp-content/uploads/2015/02/consiliul\\_concurentei\\_studiu\\_privind\\_sectorul\\_asigurarilor\\_de\\_viata\\_din\\_romania.pdf](https://www.juridice.ro/wp-content/uploads/2015/02/consiliul_concurentei_studiu_privind_sectorul_asigurarilor_de_viata_din_romania.pdf)

Subordinate insurance agents is a channel by which 31% of traditional life insurance and 17% of investment funds were intermedium in June 2014 (in this case the share dropped from almost 40% at the beginning of 2011). In the middle of 2014, in the Romanian banking

system, 40 commercial banks, either domestic banks or branches of foreign banks, were active. Responding to the Competition Council's request for information, life insurance companies indicated that 27 of these banks were active as bancassurance operators, life insurance intermediaries, which means that in the middle of 2014, 13 commercial banks did not seem to have any similarities with the life insurance sector in Romania. A large proportion of commercial banks appear to be in relation to only one life insurer, 18 of the 27 banks indicated by insurers acting as a subordinate agent for one insurance company. Only 9 of the 27 commercial banks seem to have commercial relationships with several life insurance companies, in these cases being the intermediation of products for two, maximum three life insurers. This means that, for example, from the perspective of a client of the bank seeking access to a loan involving the conclusion of a related life insurance, the choice of life insurers to provide this insurance is limited.

## Conclusions

The main challenge that this insurance system has, however, is the perception of clients: trust. The crisis has changed customer perception, made us more attentive to what we buy, what we are offered, to try to understand if we have a real need for a particular product. In 2014, confidence in the financial sector stood at 50% globally and in Europe at a much lower level - 30%. Clients have changed their behavior both as a result of a lack of confidence and the reality of digitization. Bancassurance is the second channel of insurance distribution, its implementation in the banking system leads to the efficiency and profitability of the bank, both through its security in securing the clients of bank loan contractors, as well as from the perspective of commissions received by the bank from the insurers.

---

## References

---

- Clipici, E. and Bolovan, C., 2012. Bancassurance – main insurance distribution and sale channel in Europe. Directive (EU) 2016/97 of the European Parliament and of the Council <<http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016L0097>>
- Fields L.P., Fraser, R.D. and Kolari, J.W., 2007. Is Bancassurance a viable model for Financial Firms, *Journal of Risk and Insurance*, Vol. 74, No. 4, pp. 777-794.
- Fields, L.P., Fraser, D.L. and Kolari, J.W., 2007. Is Bancassurance a Viable Model for Financial Firms?, *The Journal of Risk and Insurance*, Vol. 74, No. 4, pp. 777-794.
- Financial Supervisory Authority <[www.asfromania.ro](http://www.asfromania.ro)>
- IAC, available online at <<https://www.investopedia.com/terms/b/bancassurance.asp#ixzz56RUJkdH3>>
- Insurance Europe, available online at <<https://www.insuranceeurope.eu/annual-report-2016-2017>>
- Jin-Lung P., Jeng, V., Wang, J.L. and Yen-Chih C., 2017. The impact of bancassurance on efficiency and profitability of banks: Evidence from the banking industry in Taiwan, *Journal of Banking and Finance*.
- Kumari, T. and Dorthy, B.C., 2014. Performance Evaluation of Bancassurance- A Study on SBI Life Insurance Company. *International Journal of Social Sciences Arts and Humanities*, 1(3), pp. 29-39.
- Ng'Etich Sheila Cepkorir, 2016. Growing Role of Bancassurance in the Banking Sector: A Case of Kenya Tier 1 Local Banks.
- Păun, R., Vamvu, D., Popa, I. and Opran, F., 2014. Study on the life insurance sector in Romania, Competition Council, available online at <[https://www.juridice.ro/wp-content/uploads/2015/02/consiliul\\_concurentei-studiu\\_privind\\_sectorul\\_asigurarilor\\_de\\_viata\\_din\\_romania.pdf](https://www.juridice.ro/wp-content/uploads/2015/02/consiliul_concurentei-studiu_privind_sectorul_asigurarilor_de_viata_din_romania.pdf)>

- Pinsent, M., available online at <<https://www.out-law.com/en/topics/insurance/insurance-brokers-and-intermediaries/the-insurance-distribution-directive-changes-to-the-regulation-of-insurance-intermediaries-in-the-eu/>>
- Price Waterhouse Coopers, available online at <<https://www.pwc.lu/en/insurance/insurance-distribution-directive.html>>
- Serap O. Gonulal, Goulder, N. and Lester, R., 2012. Bancassurance A Valuable Tool for Developing Insurance in Emerging Markets, The World Bank Financial and Private Sector Development Non-Bank Financial Institutions, September.
- Zhian, C. and Jianzhong, T., 2010. Does bancassurance add value for banks? – Evidence from mergers and acquisitions between European banks and insurance companies, Research in International Business and Finance.

# Comparative Assessment of Risk-Based Capital, Solvency II and Swiss Solvency Test

**Aurora Elena DINA (MANOLACHE)**

Bucharest University of Economic Studies, Romania

aurora\_dina86@yahoo.com

**Abstract.** *The goal of this article is to provide an updated evaluation and comparative analysis of three insurance regulatory regimes: Risk-Based Capital applied in United States of America, Solvency II used in European Union and Swiss Solvency Test applied in Switzerland, considering the major revisions that have been made in recent years: Solvency Modernization Initiative in the RBC system, Solvency II implementation since January 1st, 2016 and some updates in the Swiss Solvency Test which were influenced by Solvency II. The results of research reveal that the RBC framework has been substantially improved by: operational risk implementation for all three RBC formula and catastrophe risk implementation in Property/Casualty RBC formula, Own Risk and Solvency Assessment (ORSA), Principle-Based Reserving (PBR) and seven Insurance Core Principles adoption. RBC regime still remains a rules-based system which applies statutory accounting values and represents an “one size fits all” model for all insurance companies as it does not encourage the own internal models development. In contrast, Solvency II and the Swiss Solvency Test meet to a high degree level of satisfaction the criteria developed by Cummins et al. (1994) and Holzmüller (2009).*

**Keywords:** insurance, Solvency II, Risk-Based Capital, Swiss Solvency II, risk management.

**JEL Classification:** G22, G32, G28, K23, L50.

## Introduction

The introduction of Solvency II framework, starting with January 1st, 2016 with the goal to establish a set of capital requirements and risk management standards which deliver a consistent supervisory system across all European member states, has represented a “new era” in insurance regulation. Currently, there is a global trend to a more risk-oriented regime and corporate governance, like in the European Solvency II regime. Notably, components of European Solvency II framework have been adopted in other countries. For example: Canada was one of the first countries that implemented Own Risk and Solvency Assessment (ORSA) in 2014.

Many countries have either revised or are in process of reforming their solvency regimes with the goal to assess the solvency capital requirements based a more risk based approach. Countries from Asia, America, Australia and Europe have already made or have started to make important updates to their solvency regulatory frameworks. Australia implemented in January 2013, the Life and General Insurance Capital (LAGIC) reform based on a three-pillar supervisory approach like in the Solvency II with the aim to update the prudential and reporting standards for non-life and life insurance companies. The regulatory authority for the Korean financial services industry had to review the RBC framework introduced in April 2009 due to the rapidly changing on the insurance market. The Monetary Authority of Singapore have introduced from January 1st, 2017, the features and the risk calibration of the new RBC framework. In Thailand, the Office of Insurance Commission (OIC) have implemented a risk based capital (RBC) framework and gross premium valuation (GPV) regime in January 1st, 2013. In Canada, the Minimum Capital Test for Property & Casualty Insurance Companies implemented in 2003 had to improve the risk measures. The new regime became effective on January 1st, 2018.

The main objective of this article is to provide an evaluation and comparative analysis of three most influential insurance regulatory regimes implemented around the globe: Risk-Based Capital(RBC) applied in United States of America, Solvency II used in European Union and Swiss Solvency Test (SST) applied in Switzerland. Since the publications presented in the second section of the paper, some features of the regulation frameworks have changed substantially which leads to a re-evaluation required of the three systems comparison. The most important changes under the three regimes are: Solvency Modernization Initiative adoption by the National Association of Insurance Commissioners (NAIC) in December 2010, Solvency II implementation since January 1st, 2016 after many delays and some updates in the Swiss Solvency Test influenced by Solvency II. The results of research are relevant both for insurers who need to implement the solvency requirements measures and for regulators in the process of reforming of the regulatory systems.

The remainder of the article is structured as follows. Section 2 provides an overview of the literature review. Section 3 contains the methodology applied. The comparative analysis of three insurance regulatory regimes is presented in Section 4. The main conclusions of the paper are outlined in Section 5.

## Literature review

In the insurance literature there are several research papers that present a comparison of the U.S. Risk-Based Capital (RBC), Solvency II and the Swiss Solvency Test (SST).

Cummins and Phillips (2009) showed that the Risk-Based Capital regime is out-of-date compared with Solvency II and Swiss Solvency Test, as it is not an accurate predictor of the insurance companies insolvency, ignores important risks like as catastrophe risk and operational risk, should move towards a principles-based regime, should apply the market

values of assets and liabilities as Solvency II and Swiss Solvency Test, is static and ratio-based model compared with European systems which are dynamic models and should introduce an own-risk and solvency assessment (ORSA) process such as Solvency II.

Holzmuller (2009) noted that the need for reform of the Risk-Based Capital system compared with Solvency II and the Swiss Solvency Test which, satisfied generally the criteria developed by Cummins and al. (1994) and four additional criteria, Risk-Based Capital system should move towards a principles-based system similar with Solvency II and Swiss Solvency Test, the both European frameworks present advantages like internal model approach and total balance sheet approach.

Eling and Holzmuller (2008) provided an overview and comparison of the regulatory insurance frameworks from United States, New Zealand, European Union and Switzerland. They show that the Solvency II and Swiss Solvency Test encourage the internal model development for a more accurate and individualized evaluation of an insurance company solvency situation compared to the standardized models like Risk-Based Capital.

Doff (2008) concluded that Solvency II system satisfies most of the criteria developed by Cummins and al. (1994). He recommended a more balanced between the three pillars that could increase the Solvency II framework efficiency.

## Methodology

This paper provide a qualitative evaluation of the following three insurance regimes: Risk-Based Capital, Solvency II and Swiss Solvency Test. The frameworks have been tested based on the seven criteria developed by Cummins et al. (1994):

- (1) Getting the appropriate incentives;
- (2) Formula should be risk-sensitive;
- (3) Formula should be appropriately calibrated;
- (4) Focus on the highest insolvency costs for the economy as a whole;
- (5) Focus on economic values;
- (6) System should discourage misreporting;
- (7) Formula as simple as possible.

Also, the frameworks have been tested based on the four additional criteria developed by Holzmuller (2009):

- (8) Adequacy in economic crises and anticipation of systemic risk;
- (9) Assessment of management;
- (10) Flexibility of framework over time;
- (11) Strengthening of risk management and market transparency.

## Results and discussions

In this section are discussed the advantages and disadvantages of the three insurance regimes based on the eleven criteria presented in Section 3.

### Criterion 1: Getting the appropriate incentives

This criterion accentuates the importance of including in a supervisory framework an appropriate incentives for insurers to hold more capital and/or reduce their risk exposure.

The RBC formula is factor-based, calculated by multiplying risk-factor charges by various balance sheet items. For example, in the underwriting risk are used as volume indicators: premiums and reserves. This factor-based approach to calculate the capital requirements provides incentives to insurance companies to charge lower premiums or lower reserves to

reduce their capital requirements. The new method PBR (Principle-Based Reserving) introduced as a part of the „Solvency Modernization Initiative” to calculate reserves for life policies issued starting with January 1st, 2017 may add value to this criterion. The RBC standards defined also the minimum capital requirements as a range from USD 0.5 to USD 6 million, dependent on the state and the business line. This minimum capital requirements fail to provide correct incentives because they do not take in consideration the insurers risk profile. The RBC formula fails to satisfy Criterion 1.

Solvency II and Swiss Solvency Test satisfy Criterion 1. In the both two systems, the standard approach applied to calculate the solvency capital requirements is in general risk-sensitive which means that higher risks lead to higher capital requirements. The Minimum Capital Requirement for Solvency II combines a linear formula with a floor of 25% and a cap of 45% of the Solvency Capital Requirements. Also, the MCR is subject to an absolute floor, expressed in euros, depending on the nature of the insurance company. Under the Solvency II and Swiss Solvency Test, for calculating the solvency capital requirements it can be used the standard formula provided by the regulator, they can develop their own internal model or a combination of two. Internal models and partially internal models should be validated by the supervisor and therefore it is assumed that the both systems satisfy Criterion 1.

### **Criterion 2: Formula should be risk-sensitive**

The first aspect of Criterion 2 stipulates that solvency systems, in order to reduce the possibility of the arbitrage in system, should cover all major types of risk. All three systems take into account the main types of risks as the following: market risk, credit risk, underwriting risk and operational risk.

As part of the Solvency Modernization Initiative (SMI), the operational risk and catastrophe risk were included in the RBC formula. Starting with 2017 year, a standard factor approach for operational risk was adopted for all three RBC formula. For the 2017 reporting year, the most significant update is represented by the additional of a charge in the Property/Casualty RBC formula for catastrophe risk from the hurricane and earthquake perils.

Solvency II includes a quantitative approach related to the operational risk. The catastrophe risk in Solvency II formula is taken into account under the underwriting risk. Under the Swiss Solvency Test, operational risk is treated qualitatively because it is considered inherent risk and it is difficult to measure. The catastrophe risk in Swiss Solvency Test is determined by predefined scenarios.

The second aspect of Criterion 2 indicates that the formula should be risk-sensitive. The RBC formula for many categories of risk are not risk-sensitive, due to the volume-based capital charges that are independent of business risk written by the insurance company. Solvency II is considered in general more risk-sensitive except the operational risk, nonlife and health underwriting risks which are factor-based charges. Similar with Solvency II, Swiss Solvency Test is risk-sensitive, except the operational risk which is covered qualitative.

The third aspect of Criterion 2 specifies that the solvency regims should not disadvantage small insurance companies. Even if Solvency II and Swiss Solvency Test impose high implementation costs that could be considered a potential discrimination for small insurance companies, the two solvency systems provide standard approaches to calculate the solvency capital requirements which are easier to implement. Moreover, in the Solvency II formula, to facilitate compliance for young and small insurers, it may be applied the proportionality principle.

Consequently, the RBC formula satisfies Criterion 2 to a partly degree level, the Solvency II and Swiss Solvency Test satisfy Criterion 2.



**Criterion 3. Formula should be appropriately calibrated**

According to this criterion, all three solvency systems should be examined based on: the dependencies between the different categories of risk, the time horizon and the confidence level applied.

Under the RBC formula, the individual risk charges are aggregated by a fairly simplistic covariance formula (essentially assuming a covariance of either 0 or 1). The dependencies between the different risk categories are not correctly accounted under RBC formula. In contrast, under Solvency II and Swiss Solvency Test, the dependencies between the different risk categories are correctly accounted. The first aspect of Criterion 3 is satisfied by RBC formula to a low degree compared to Solvency II and Swiss Solvency Test, which fully satisfied this criteria.

The time horizon for all systems is one year.

The RBC formula is in general factor-based with some internal models for interest rate and market risk. The NAIC introduced in 2005 a new capital requirement regarding the equity risk associated with variable annuities. The RBC for variable annuities may be calculated applying an internal model calibrated based on the expected shortfall to a confidence level of 90%.

The solvency capital requirements under the Solvency II standard formula “it shall correspond to the Value-at-Risk of the basic own funds of an insurance or reinsurance undertaking subject to a confidence level of 99,5 % over a one-year period” [European Commission, 2009, p. 113]. “This corresponds to a one-year ruin probability of 0.5 percent, assumed equivalent to a BBB financial strength rating” [European Commission, 2004, p. 35].

The solvency capital requirements, in compliance with the Swiss Solvency Test, are “based on the expected shortfall of change of risk bearing capital over a 1 year time horizon on a 99% confidence level. This corresponds to approximately 99.6% to 99.8% Value-at-Risk or a strong BBB rating” [Federal Office of Private Insurance, 2006, p. 8].

Expected Shortfall is considered a more accurate risk measure than Value-at-Risk in the predicting of the insurers insolvency. Consequently, the RBC formula satisfies Criterion 3 to a low degree level, Solvency II satisfies Criterion 3 and Swiss Solvency Test fully satisfy Criterion 3.

**Criterion 4. Focus on the highest insolvency costs for economy as a whole**

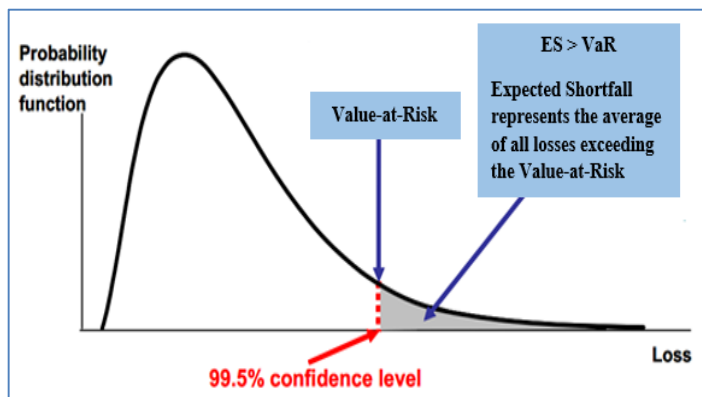
The larger insurers failures, although they are characterized by a lower occurrence frequency, may impose higher costs to the economy. This criteria is based on an analysis made by Cummins et al. (1994) to approximately 200 insurers failures which show that the most costs of insolvency was induced by a small number insolvencies of larger insurance companies. Increasing the solvency regulation for larger insurance companies can reduce the insolvency costs for the (macro) economy.

The RBC applies a factor-based model to calculate the necessary capital requirements which leads to a failure to satisfy this criterion. ORSA implementation, as part of the NAIC Solvency Modernization Initiative, for all the states by the end of 2017, allows regulators to form an improved view about the ability of the insurance companies to withstand financial stress. Consequently, the RBC satisfies Criterion 4 to a low degree.

On the contrary, Solvency II and the SST are dynamic cash-flow-based models, in which probabilistic risk measures are used to calculate the solvency capital requirements. The Value-at-Risk is applied in the Solvency II and Expected Shortfall is used in the Swiss Solvency Test regulatory regime. Expected Shortfall is an accurate risk measure that can be applied in the insurer risk profile evaluation. Selection the Expected Shortfall as a risk measure is considered more accurate to reflect the extreme events (e.g. catastrophe risk with high impact). Value-at-

Risk focuses only on the insolvency loss probability to a specified loss distribution and does not measure the loss severity in case of a potential insolvency if the quantile level is exceeded. While, Expected Shortfall measures both the frequency and the severity of insolvency losses beyond the threshold of the quantile. The figure below presents an example of how Expected Shortfall and Value-at-Risk are derived from a loss distribution function.

**Figure 1.** *Illustration of Value-at-Risk and Expected Shortfall*



Source: [CEA, 2006, p.4]

The Value-at-Risk selection as a risk measure to assess the necessary capital requirements in the context of Solvency II standard formula does not have significant impact for large insurance companies because they may apply their internal models in which they can use alternative risk measures as Expected Shortfall if they think these are more adequate for their business.

Both Solvency II and Swiss Solvency Test capital requirements, calculated on dynamic cash-flow-based models, are accompanied by ORSA for a global and consistent view of an insurance companies risk profile. Consequently, Solvency II satisfies Criterion 4 and Swiss Solvency Test fully satisfies Criterion 4.

### **Criterion 5. Focus on economic values**

The majority of the insurance companies in the United States prepare the regulatory reporting in accordance with the SAP (Statutory Accounting Principles). SAP is based on the GAAP (Generally Accepted Accounting Principles) framework, with rejects or differences in certain areas. SAP are designed to assist the regulation of the insurers' reporting, while GAAP is used in the reporting for other financial user or investors. In general SAP financial statements are considered more conservative compared to GAAP financial statements and have less potential balance sheet variation from year to year than GAAP.

In the Solvency II, the solvency evaluation of an insurance company is in conformity with the economic balance sheet. This gives an economic, risk-based image of the actual solvency position of an insurers at a given point in time. Liabilities (except the technical provisions which should be valued based on the best estimate principle) and assets are valued at fair value in accordance with IFRS (International Financial Reporting Standards). The Solvency II balance sheet is not completely consistent with IFRS financial statements, due to some specific conditions (for example intangible assets) and prudential exemptions (by example goodwill). The variation from year to year of the Solvency II balance sheet is greater than SAP.

In the Swiss Solvency Test, assessment of the assets and liabilities is in accordance with the market-consistent valuation. Whenever possible, the assets should evaluate to the market values or an appropriate model can be applied to estimate the current value of the assets. The liabilities should be valued based on the best estimate principle.

Consequently, RBC fails to satisfy criterion 5, Solvency II and Swiss Solvency Test fully satisfy Criterion 5.

### Criterion 6. System should discourage misreporting

In any of the three solvency systems, the potential misreporting problem is not clearly explicitly. The sanctions about data manipulation in order to decrease the capital requirements should be transparent and clearly defined for all the participants.

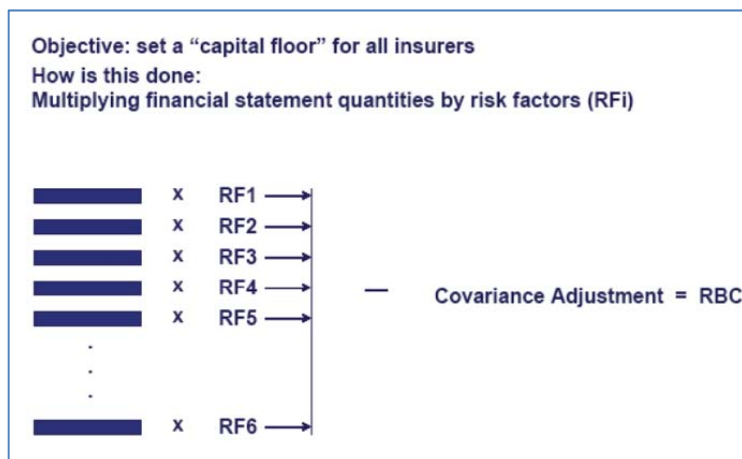
The RBC applies a factor-based model to calculate the necessary capital requirements in which the misreporting may induce a significant reduction of the solvency capital requirements. RBC does not satisfy criterion 6.

Solvency II and the Swiss Solvency Test use dynamic cash-flow-based models to calculate the solvency capital requirements, in which the misreporting to decrease capital requirements has a lower impact than in the RBC system. Both, Solvency II and Swiss Solvency Test are principles-based regulatory systems based more on the individual insurer responsibility than strict rules. Solvency II and Swiss Solvency Test satisfy Criterion 6 to a low degree.

### Criterion 7. Formula as simple as possible

RBC, in essence represents a measure of risk. For each business line (life, health and property/casualty) are used distinct formulas in accordance with the specific business line characteristics of risk. The RBC formula is calculated using the following steps: (1) apply risk factors to statutory annual statement figures; (2) sum risk amounts and adjust applying a covariance formula; (3) calculate authorized control level RBC amount (ACL) and (4) compare ACL to total adjusted capital (TAC). Figure 3 provides an overview of the RBC formula.

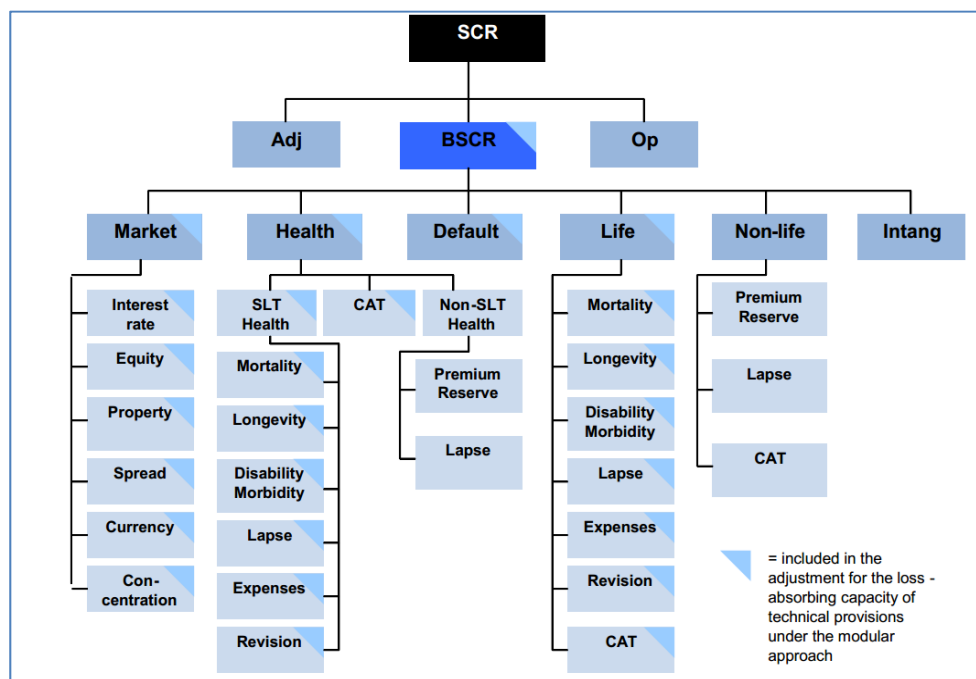
Figure 2. RBC formula



Source: [Cummins and Phillips, 2009, p.27]

The new method PBR (Principle-Based Reserving), adopted starting with January 1st, 2017 for the the U.S. life insurance companies to calculate the policy reserve, adds value to this criterion. Overall, the U.S. RBC formula, compared to Solvency II and the SST is relatively simple and as a result, Criterion 7 is partly satisfied.

Solvency II uses a modular structure to calculate the solvency capital requirements. For each risk module/sub-risk module are calculated the capital requirements. Afterwards, these capital requirements, by using a correlation matrices, are aggregated into an overall solvency capital requirement. Figure 4 presentes an overview of the Solvency II formula.

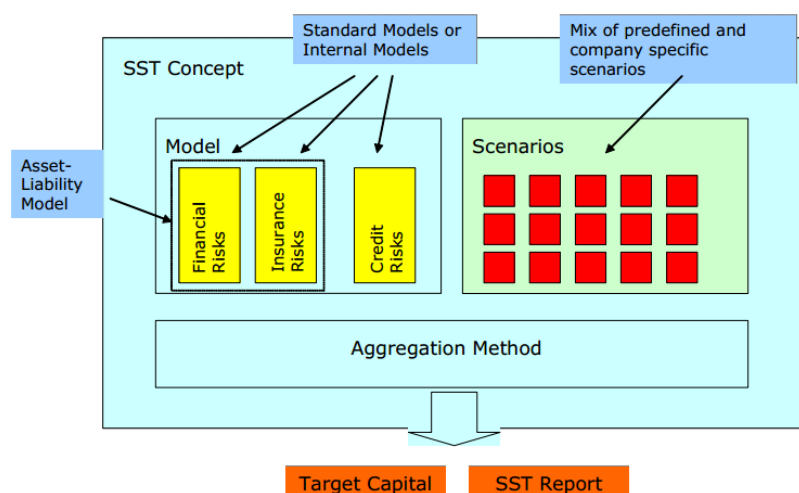
**Figure 3.** Solvency II formula

**Source:** [European Insurance and Occupational Pensions Authority, 2014, p.6]

The economic balance sheet of assets and liabilities and Value-at-Risk application as a risk measure lead an increase to Solvency II formula complexity. Consequently, Solvency II satisfies Criterion 7.

The Swiss Solvency Test applies a holistic approach taking all the risks into the calculation. The market, credit and underwriting risk are determined by applying a stochastic modeling approach. Other risks than market, credit and underwriting are quantified based on scenario analysis. The results of the stochastic modeling approach and the scenario analysis are integrated through a prescribed aggregation method that takes into account covariability among risks.

Figure 5 presents an overview of the Swiss Solvency Test formula.

**Figure 4.** Swiss Solvency Test formula

**Source:** Swiss Federal Office of Private Insurance, 2004, p. 10.

The Swiss Solvency Test is considered more complex than Solvency II mainly due to the performance of scenario it analyses and the Expected Shortfall application as a risk measure,

which is considered more accurate than Value-at-Risk. Consequently, Swiss Solvency Test satisfies Criterion 7.

### **Criterion 8. Adequacy in economic crises and systemic risk**

Allen and Gale (2007) note that “there is evidence that risk has been transferred from the banking sector to the insurance sector. One argument is that this is desirable and simply reflects diversification opportunities. Another argument is that, it represents regulatory arbitrage and, the concentration of risk that may result from this, could increase systemic risk” [Allen and Gale, 2007 p. 342]. Few months later, in 2008 year, Federal Government from United States had to rescue the insurer American International Group (AIG) known “as “too big to fail” to prevent a bankruptcy with possible risk systemic implications.

Numerous authors, since 2009 have shown that the insurance activity is not systemic by design: only non-insurance and non-traditional activities, like in the AIG case, may lead to systemic risk.

Bierth et al. (2015) applying three measures: conditional value at risk, linear Granger causality test and marginal expected shortfall on three groups: banks, insurers and non-financial companies shown that “Insurers do cause systemic risk, especially when they engage in non-insurance activities, e.g. banking activities. Furthermore, we find that systemic risk in the insurance industry is mainly driven by the liability side, i.e. the capital structure rather than the asset side: however, on the asset side we find that the level of diversification is also a strong determinant of systemic risk, although further investigation is needed” (Bierth et al., 2015, p.17).

Baranoff (2015) showed that the majority of large insurers failures were linked to the interest rate risk (mainly in Japan during the 2000's).

Thimann (2015) offered a classification of insurance activities, as well as balance sheet and products in accordance with their systemic risk (for example: pure life annuities do not present systemic risk, whereas variable annuities with living benefits present systemic risk).

To prevent bankruptcies with possible risk systemic implications, insurance companies should apply different models for the solvency capital calculation. The principle-based approach of the Solvency and Swiss Solvency Test gives more flexibility for insurers to apply internal models in managing with their risk profiles. Flexibility based on the application of various risk strategies can limit the possibility of systemic risk occurrence, while applying a single standard framework for all or for majority of insurance company may expose to high level of systemic risk.

The RBC satisfies to a low level Criterion 8, Solvency and Swiss Solvency Test satisfy Criterion 8.

### **Criterion 9. Assessment of management**

In an analysis of failures insurers, Sharma Report found that most insurers failures were based on the inexperienced management (Conference of Insurance Supervisory Services of the Member States of the European Union, 2002).

In 2001, Howard Davies, the first Chairman of the U.K. Financial Services Authority said “But we have learnt, from better experience, that no amount of capital is enough if the management in charge of it is incompetent, and the control systems are fatally flawed” (Ashby, 2011, p.12)

Corporate governance is taken into account in all three systems.

In November, 2014 the NAIC adopted the Corporate Governance Annual Disclosure Model Act and Regulation. Starting with June 1st, 2016, each U.S. insurance company must submit

a Corporate Governance Annual Disclosure (CGAD) in which included a description of “how the qualifications, expertise and experience of each Board member meet the needs of the insurer or insurance group” (NAIC, 2014, p.3). The report contains “a description of the following factors: (1) Any processes or practices (i.e., suitability standards) to determine whether officers and key persons in control functions have the appropriate background, experience and integrity to fulfill their prospective roles..... code of business conduct and ethics, the discussion of which considers, for example: (a) Compliance with laws, rules, and regulations; and (b) Proactive reporting of any illegal or unethical behavior.” (NAIC, 2014, p.4)

In the Solvency II system, as part of the qualitative requirements, in Pillar II are included “The fit and proper requirements apply to all persons who effectively run the undertaking or have other key functions in order to ensure that all the persons having relevant functions in the undertaking are appropriately qualified” (EIOPA, 2010, p.2).

Risk management is included also in Swiss Solvency Test, inside of the corporate governance framework: “the board of directors as a body must have sufficient knowledge of the insurance business and the requisite experience and knowledge of business management, strategic management, risk control, and finance and accounting (FINMA, 2016, p.4)

Consequently, RBC, Solvency II and Swiss Solvency Test satisfy Criterion 9.

#### **Criterion 10. Flexibility of framework over time**

The most common reasons that lead to the inflexible of the solvency systems are: the slow political process, multiple stakeholders and wide geographic scope. Swiss Solvency Test, benefits from a reduced geographical application (only Switzerland), in contrast, Solvency II and RBC, which are applied to countries / federation of states.

The small updates and changes are easier to implement in system designed by a principles-based approach which in general is considered more flexible and adaptable like Solvency II and Swiss Solvency Test compared to RBC which is rules - based system. RBC satisfies this criterion to a low degree level, Solvency II satisfies this criterion to a partly degree level and Swiss Solvency Test satisfies Criterion 10.













#### **Criterion 11. Strengthening of risk management and market transparency**






















Under all three systems, the insurers must submit annually to regulator “ORSA Report” to assess the adequacy of their risk management and current and prospective solvency positions under normal and severe stress scenarios. All the three systems have a similar concept of ORSA.

The second aspect of Criterion 11 about market transparency is satisfied by RBC formula in accordance with U.S. Insurance Financial Solvency Core Principle 1: Regulatory Reporting, Disclosure and Transparency. Solvency II satisfies the second aspect of Criterion 11 about market transparency in accordance with Pillar III and Swiss Solvency Test satisfies based on the FINMA Circular 2016/XX “Disclosure”. Consequently, RBC, Solvency II and Swiss Solvency Test are fully satisfy Criterion 11.

Table 1 summarises the results of the three insurance regulatory regimes comparative analysis.

**Table 1.** Comparative assessment RBC, Solvency II and Swiss Solvency Test.

Criterion	Risk-Based Capital	Solvency II	Swiss Solvency Test
1. Getting the appropriate incentives			
2. Formula should be risk-sensitive			
3. Formula should be appropriately calibrated			
4. Focus on the highest insolvency costs for economy as a whole			

5. Focus on economic values			
6. System should discourage misreporting			
7. Formula as simple as possible			
8. Adequacy in economic crises and systemic risk			
9. Assessment of management			
10. Flexibility of framework over time			
11. Strengthening of risk management and market transparency			

**Legend:**  Unsatisfied  Low satisfied  Partly Satisfied  Satisfied  Full Satisfied

**Source:** adapted from Holzmüller (2009), p.75

## Conclusions

The results of the research reveal that the RBC framework has been substantially improved as a part of the NAIC „Solvency Modernization Initiative” compared with the results of the previous research papers which was published before these revisions. The most important improvements that have been added value to this analysis are : operational risk implementation for all three RBC formula and catastrophe risk implementation in Property/Casualty RBC formula starting with 2017 year, ORSA implementation from June 1st, 2016, the PBR (Principle-Based Reserving) since January 1, 2017 and seven Insurance Core Principles. RBC regime still remains a rules-based system which applies statutory accounting values and represents an “one size fits all” model for all insurance companies as it does not encourage the own internal models development. In contrast, Solvency II and the Swiss Solvency Test meet to a high degree level of satisfaction the criteria developed by Cummins et al. (1994) and Holzmüller (2009).

## References

- Allen, F. and Gale, D., 2007. Systemic Risk and Regulation. University of Chicago Press.
- Ashby, S., 2011. Risk management and the global banking crisis: Lessons for insurance solvency regulation. Geneva Papers on Risk and Insurance—Issues and Practice, 36(3), pp. 330-347.
- Baranoff, E., 2015. U.S. and Japan Life Insurers Insolvencies Case Studies – Lessons learned. from resolutions. The Geneva Association, available at: <[https://www.genevaassociation.org/sites/default/files/research-topics-document-type/pdf\\_public/ga2015-insurance-resolution.pdf](https://www.genevaassociation.org/sites/default/files/research-topics-document-type/pdf_public/ga2015-insurance-resolution.pdf)>
- Bierth, C., Irresberger, F. and Weiß, G.N.F., 2015. Systemic risk of insurers around the globe. *Journal of Banking & Finance*, 55, pp. 232-245.
- Conference of Insurance Supervisory Services of the Member States of the European Union, 2002. Prudential Supervision of Insurance Undertakings, Report prepared under the Chairmanship of Paul Sharma, Head of the Prudential Risks Department of the UK’s Financial Services Authority.
- Comité Européen des Assurances (CEA), 2006. CEA Working Paper on the Risk Measures VaR and TailVaR, available at: <[http://ec.europa.eu/internal\\_market/insurance/docs/2006-markt-docs/2534-06-annex-cea\\_en.pdf](http://ec.europa.eu/internal_market/insurance/docs/2006-markt-docs/2534-06-annex-cea_en.pdf)>
- Cummins, J.D., Harrington, S. and Niehaus, G., 1994. An economic overview of risk-based capital requirements for the property–liability insurance industry. *Journal of Insurance Regulation*, 11(4), pp. 427-447.
- Cummins, J.D. and Phillips, R.D., 2009. Capital adequacy and insurance risk-based capital systems. *Journal of Insurance Regulation*, 28, pp. 25-72.
- Doff, R., 2008. A critical analysis of the Solvency II proposal. The Geneva Papers on Risk and Insurance: Issues and Practice, 33(2), pp. 193-206.
- Eling, M. and Holzmüller, I., 2008. An overview and comparison of risk-based capital standards. *Journal of Insurance Regulation*, 26(4), pp. 31-60.

- European Commission, 2004. Solvency II – Organisation of Work, Discussion on Pillar I Work Areas and Suggestions of Further Work on Pillar II for CEIOPS, available at: [http://ec.europa.eu/internal\\_market/insurance/docs/markt-2543-03/comments/others/aisam\\_comments\\_2543-03\\_en.pdf](http://ec.europa.eu/internal_market/insurance/docs/markt-2543-03/comments/others/aisam_comments_2543-03_en.pdf)
- European Commission, 2009. Directive 2009/138/EC of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II), available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0138&from=EN>
- European Insurance and Occupational Pensions Authority, 2010. Guidelines on system of governance, available at: [https://eiopa.europa.eu/Publications/Guidelines/Final\\_EN\\_SoG\\_Clean.pdf#search=Final%20EN%20SoG%20Clean](https://eiopa.europa.eu/Publications/Guidelines/Final_EN_SoG_Clean.pdf#search=Final%20EN%20SoG%20Clean)
- European Insurance and Occupational Pensions Authority (2014). The underlying assumptions in the standard formula for the Solvency Capital Requirement calculation, available at: [https://eiopa.europa.eu/Publications/Standards/EIOPA-14-322\\_Underlying\\_Assumptions.pdf](https://eiopa.europa.eu/Publications/Standards/EIOPA-14-322_Underlying_Assumptions.pdf)
- Federal Office of Private Insurance, 2006. The Swiss experience with market consistent technical provisions – the cost of capital approach, available at: [https://eiopa.europa.eu/Publications/QIS/SwissCostofCapital\\_28\\_03\\_2006.pdf](https://eiopa.europa.eu/Publications/QIS/SwissCostofCapital_28_03_2006.pdf)
- Federal Office of Private Insurance, 2004. White Paper of the Swiss Solvency Test, available at: [https://www.finma.ch/FinmaArchiv/bpv/download/e/WhitePaperSST\\_en.pdf](https://www.finma.ch/FinmaArchiv/bpv/download/e/WhitePaperSST_en.pdf)
- Federal Office of Private Insurance, 2016. Corporate governance, risk management and internal control system at insurers,
- Holzmüller, I., 2009. The United States RBC Standards, Solvency II and the Swiss Solvency Test: a Comparative Assessment. *The Geneva Papers on Risk and Insurance – Issues and Practice*, 34(1), pp. 56-77.
- Thimann, C., 2015. The economics of insurance, its borders with finance and implications for systemic regulation. *CESIFO working paper*, No. 5207.



# Redesigning Optimal Mechanisms in Social Assistance

**PhD. Cosmin SERBANESCU**

National Institute of Internal Control, Bucharest, Romania  
cosmin.serbanescu@incir.ro

**PhD. Adrian VINTILESCU**

National Institute of Internal Control, Bucharest, Romania  
adrian.vintilescu@incir.ro

**PhD. Lacramioara CORCHES**

Expert  
lacramioara.corches@yahoo.com

**Abstract.** *The need to redesign social assistance mechanisms for poverty relief appears as a natural consequence of changing (sometimes frequent) parameters. The substantiation of the changes to the mechanisms must be transparent, appropriate and above all formal. Thus, it is necessary to carry out impact studies especially in the public revenues redistribution system through poverty aids where the needs of change are often determined both by the volatility of the macroeconomic environment and the social context.*

*The study aims to create a simple, formal, quantitative algorithm for assessing the impact of implementing a public social assistance policy that can be quickly analyzed by decision-makers or even by the public. The quantitative model achieved can be used in the public policies design and aggregates the information into a two-part scorecard that pertains to the specificity of the chosen field and, on the other hand, the observance of general principles of optimal contracts under conditions of informational asymmetry.*

*The specificity of the field chosen in the paper (poverty relief) was analyzed using artificial intelligence techniques, namely data mining algorithms, which are an important component of the new industrial revolution that humanity is currently going through. The result of this type of analysis was to determine a coherent prediction model underlying a sensitivity analysis. The second component approached the specificity of the management policy that was analyzed using principles derived from the theory of mechanism design, resulting in the determination of the possibilities for effective enforcement of public policies to combat poverty.*

*The results have been aggregated into a decision tool based on a scorecard that can underpin the formal and rapid foundation of a public policy decision. The study is useful to specialists in designing optimal redistribution mechanisms for public revenue in social care and can be easily extended to other areas.*

**Keywords:** government policy, provision and effects of welfare programs, measurement and analysis of poverty, asymmetric and private information, mechanism design, forecasting and prediction methods, simulation methods, criteria for decision-making under risk and uncertainty.

**JEL Classification:** I38, I32, D82, C53, D81.

## Introduction

The efficiency of spending public funds in social assistance programs is a major desideratum for any public policy. That's why designing them is very important, just like the mechanisms developed for their application. The difficulty in determining the specific tools, channels, and mechanisms for a redistribution policy (social assistance) is as high as the administration of taxes and fees [1].

If optimality in designing social care programs is a specific attribute of a social policy, another equally important component is the creation of management channels to ensure that a high efficiency is achieved. The comparison with fiscal policy and tax administration is relevant. Thus, we can state that the optimal transfer mechanisms have specific features although closely linked to the public policy programs design [2].

The paper proposes an algorithm for rapid analysis of the implementation of a social assistance program starting from the targets defined according to a specific model, until the creation of an administration mechanism of the social assistance benefits. The study consists of two parts: the first one dealing with the dependence of certain social policy output indicators on other relevant input indicators (for this stage the authors proposed an algorithm of artificial intelligence) and in the second part, using a simple decision model outlines the premises of creating or refining the administration mechanisms (for this component the authors used the theory of mechanism design principles).

Given the importance and complexity of anti-poverty programs, the authors considered the research as a concrete example in the area of social assistance. Obviously, the model can be extended to other areas of redistribution policies specific to public finances and institutional reorganization, if governments are proposing to streamline their public administration.

The definition of poverty itself contains several components like income or wealth, others having a strong psychological impact. In a World Bank study, this complex phenomenon is very eloquently highlighted by the claim of a person in a high-poverty state: "Do not ask me what poverty is because you have met it outside my house. Look at the house and count the number of holes. Look at my utensils and the clothes that I am wearing. Look at everything and write what you see. What you see is poverty" - A poor man, Kenya, 1997 [3].

Therefore, it is immediately noted that the first component of poverty is given by low wealth (low incomes and/or material shortages). In this respect, in many countries, the use of income or wealth testing to identify cases subject to poverty programs and the inclusion in the target group of poor people with low incomes or acute material shortages are used to substantiate redistribution programs, on the basis of existing information [4]. Obviously, this revenue-based targeting may have such under-mistakes when a person is not included although it should be or overlapping situations when a person is included although he/she should not be.

Another component of poverty is a broader definition of utility function, for example the consequences of belonging to a social group [5]. This component is often difficult to determine, and therefore more mechanisms are needed to help create a specific poverty management system. In any case, the management mechanisms should be adapted to the factors that determine the sensitivity of the poverty indicators and they should take into account the economic policy, the local demographic and the social context.

Political stability and corruption also influence the precision of targeting within the processes that determine eligibility for beneficiaries. In these circumstances, in order to meet the efficiency criteria, it is important to create formal analysis mechanisms for the problem of implementing, modifying or adapting administration programs and tagging mechanisms.

In general, these programs are projected into the public system, but if we only refer to corporate social responsibility, we see that in this case a formal analysis is needed. Often,

decisions have to be taken quickly. Consequently, it is necessary to create a model of analysis that contributes to the effective and formal design of poverty reduction programs.

Determining the general factors on which poverty depends it is an important milestone in building appropriate social policies [6]. In the first part of the study the authors used an artificial intelligence method which consisted in the unsupervised determination of some factors that characterize poverty and the pattern recognition specific to data mining processes. Factor determination was performed using a data mining algorithm. Data mining is an important component of the new industrial revolution that we are going through, and is the computing process of discovering patterns in data sets involving methods at the intersection of machine learning, statistics, and database systems [7]. Quantitative methods such as classification or clustering algorithms have also been used in research papers by the authors: Alkire [8], Bossert [9], Bourguignon [10], Antony [11], Muro [12] and Silber [13].

The second part of the study consisted in the analysis of transfer management mechanisms in human society and used the mechanism design theory principles, informational asymmetry and principal - agent theory. Mechanism design is a field in economics and game theory that takes an engineering approach to designing economic mechanisms or incentives, towards desired goals, in strategic settings, where players act rationally [14]. A mechanism is a game in which agents send messages and the principal chooses a result or allocation based on received messages [15]. Agents choose to accept or reject the mechanism. Agents that accept the mechanism play the game specified by the mechanism [16].

The principle of revelation is a key instrument in the design mechanisms and it was developed by Maskin [17], Holmstrom [18] and Myerson [19], relying on the ideas of Gibbard [20] and Aumann [21] and characterizes the results of all equilibria possible of all games that can be designed with different coordination mechanisms.

### Determining the variables on which poverty depends using pattern recognition

It is difficult to define a set of indicators to provide a true picture of redistribution policies effectiveness. Therefore, it is important to find data sources that provide the possibility of such an analysis [22]. Arrow demonstrated that there is no perfect method of aggregating indicators, in the assumptions of complying with some reasonable conditions [23]. The design of public policies using the concept of data mining is part of the development of the modern society in which artificial intelligence has an important role.













The authors analyzed a compact, very large volume database that revealed multiple components which can be examined using data mining concepts. The data used was taken from the SGI website, <http://www.sgi-network.org/2017/> and includes the annual indicators for the 2014-2017 period (Annex 1). The analysis was performed for a number of 41 countries, presented in Annex 2. In order to determine the marginal influences, the authors also calculated the order-1 and order-2 differences of each variable for each country.

Taking into account the objective of the study, namely to verify the poverty dependence on a very large set of input data, the authors considered appropriate to take into account the preparation and transformation of the raw data and the marginal growth indicators<sup>(1)</sup>. Practically, the indicators in the examined database were triple in number by defining new indicators resulting from the derivation of a benchmark against both the value of the previous year and the value of 2 years ago. Using this methodology, there were two years of reference for which there is a complete set of data, namely 2017 and 2016.

For each year's data above, the authors used a data mining technique having as variable the output poverty rate. Poverty rate is the output indicator that characterizes poverty, it is included in the Eurostat databases and is defined as a cut-off point of 50% of the median

equivalised disposable income [24]. Considering this poverty rate, the authors applied to the database a data mining technique known as the Numeric Predictor [25] to signal predictive models with a relatively small error. From the models predicted by the Numeric Predictor method, the CHAID [26] model is the most appropriate data mining model for 2016 and 2017 data, given the number of fields used (Annex 4).

**Figure 1.** *Numeric Predictor Method*

2016						2017					
Graph	Model	Build Time (mins)	Correlation $r^2$	No. Fields Used	Relative Error	Graph	Model	Build Time (mins)	Correlation $r^2$	No. Fields Used	Relative Error
	Regression 1	< 1	1	40	0		Regression 1	< 1	1	40	0
	Generalized Line...	< 1	1	509	0		Generalized Line...	< 1	1	180	0
	C&R Tree 1	< 1	1	65	0.001		C&R Tree 1	< 1	0.999	64	0.001
	CHAID 1	< 1	0.984	7	0.032		CHAID 1	< 1	0.974	8	0.053
	Neural net 1	< 1	0.849	509	0.283		SVM 1	< 1	0.811	180	0.358
	SVM 1	< 1	0.355	509	0.881		Neural net 1	< 1	0.765	180	0.454

**Source:** authors own research results.

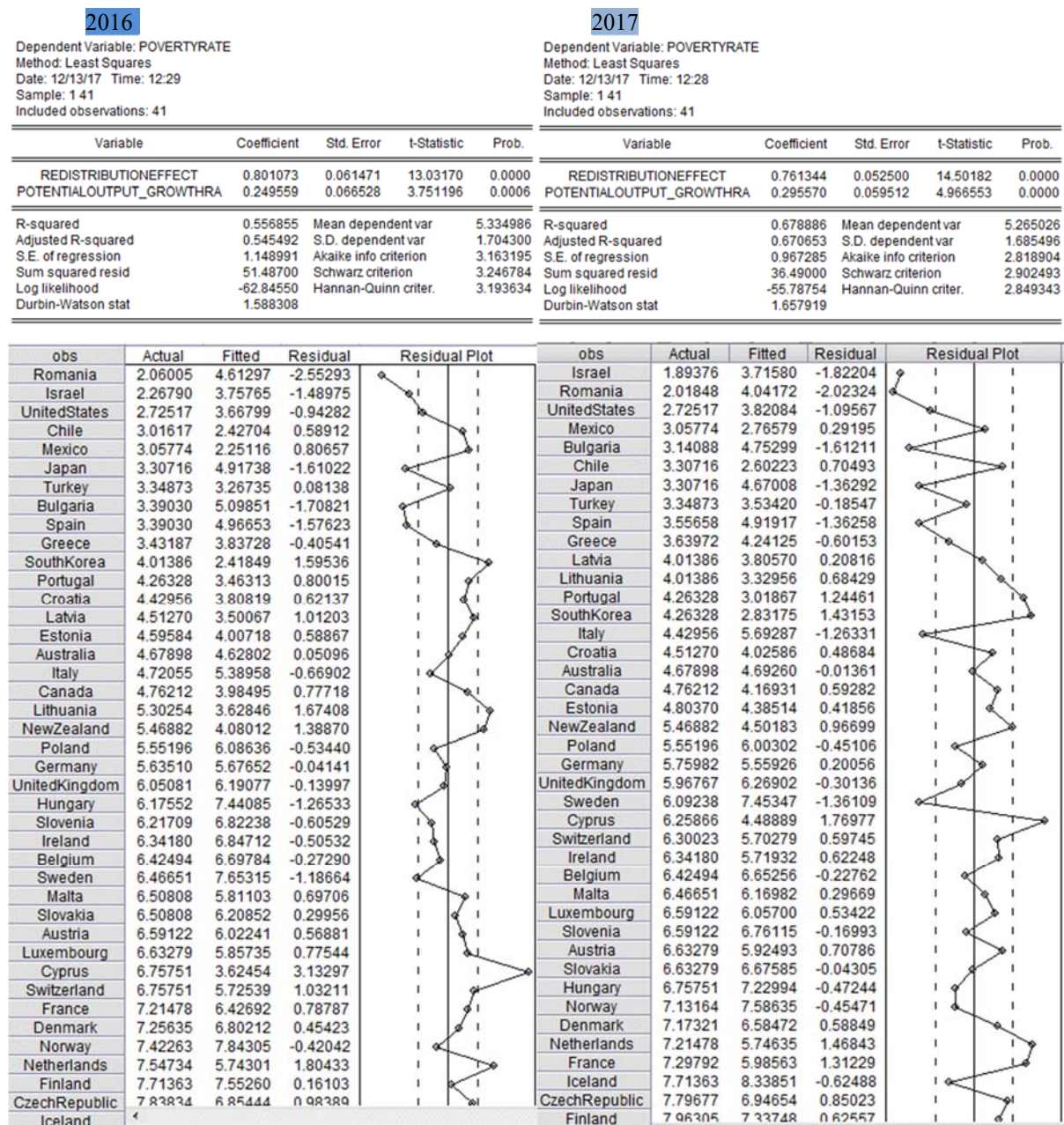
Using the CHAID technique for the years considered (2016 and 2017) have emerged two common variables for the two models (Redistribution Effect and Potential Output Growth Rate). Basically, at this stage, the number of input indicators was reduced to a very small number of indicators (two in this case) that can be the basis of an analysis that would show the variation of the output indicator compared to other indicators analyzed.

**Redistribution Effect:** represents the percentage reduction of the Gini coefficient by taxes and transfers.

**Potential Output Growth Rate:** in economics, potential output (also referred to as "natural gross domestic product") refers to the highest level of real gross domestic product (output) that can be sustained over the long term.

The existence of a limit is due to natural and institutional constraints. If actual GDP rises and stays above potential output, then (in the absence of wage and price controls) inflation tends to increase as demand for production factors exceeds supply. This is caused by the limited supply of workers and their time, capital equipment, and natural resources, along with the limits of our technology and our management skills. Potential output in macroeconomics corresponds to one point on the production possibilities frontier (or curve) for a society as a whole, reflecting natural, technological, and institutional constraints. Potential output has also been called the "natural gross domestic product" [27].

Using the above defined indicators, the authors applied a multivariate regression model to observe the explained variable dependency, the poverty rate, against the two indicators (explanatory variables).

**Figure 2.** Regression and regression error

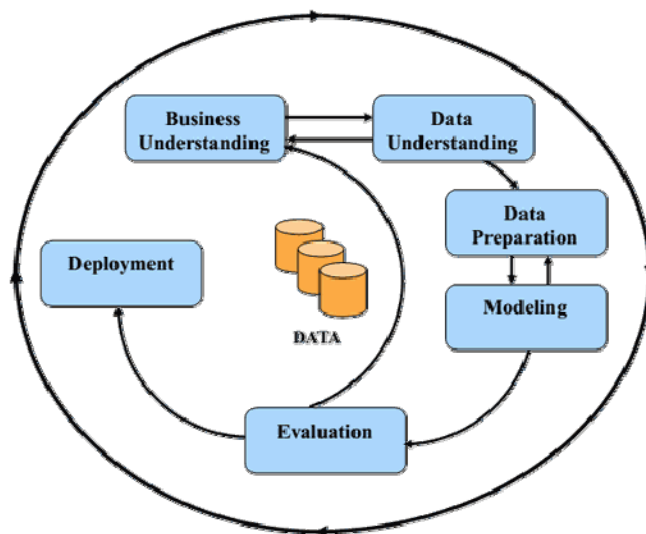
Source: authors own research results.

The regression confirms that an important component in the determination of poverty is given by the redistribution effect to the economic growth, which confirms the known economic theories [28]. The full regression data can be found in Annex 3.

It also follows that the income inequality component (coefficient of about 0.7) is more important than the component of potential economic growth (coefficient of about 0.3). This finding is basically the result of the first part of the study and symbolizes the characteristic of the component that gives the specificity of the domain as mentioned earlier.

We also note that the above analysis includes the stages of a data mining process that is primarily performed according to the **C**Ross **I**ndustry **S**tandard **P**rocess for **D**ata **M**ining technology presented in the figure below [29].



**Figure 3.** *CRISP Data Mining Technology*

Source: [https://commons.wikimedia.org/wiki/File:CRISP-DM\\_Process\\_Diagram.png](https://commons.wikimedia.org/wiki/File:CRISP-DM_Process_Diagram.png)

Thus, once the problem has been defined, the dataset was analysed based on a defined modeling process. The authors also tested other models [30], [31] and will continue to carry out revisions of the model itself which will not influence the procedure of determining the optimal mechanisms.

### Optimal mechanisms for managing social assistance benefits and reducing relative poverty

In designing social benefits administration structures, certain phases must be taken into consideration for a public policy objective, namely:

- Public policy development and monitoring (forecast) phase - which can be carried out by a central institution that performs impact analysis and modeling;
- The regulatory phase - which can be achieved by a specialized structure or the legal department within the central institution;
- Effective implementation phase - which can be performed by a lower-ranking public credit institution that actually targets the beneficiaries who may be included as a public target or by several institutions that have some collaboration and/or control relationships between them;
- Coordination and methodological guidance phase - which can be done by a department in the administration structure or a compartment within the central structure or by a lower public credit authorizer;
- The inspection and control function - which can be carried out either by an inspection institution or by a structure within the central institution or by a lower public credit authorizer.

Looking at the above picture, practically, it is carried out the phenomenon of delegation by the state to various structures for the public policy achievement under informational asymmetry. In this regard, we may ask a few obvious questions: How should the architecture of institutions and attributions look like in order to ensure efficiency? What are the criteria underlying such a decision?

We can see the institutional structure as a chain of institutions from the central ones to the local ones in which the state delegates a certain component or responsibility. The agent theory can be applied in the public sector, including as a result of identifying the many relationships that are established between citizens or various entities.

Thus, Parliament mandates the Government to lead state executive activities, ministries mandate subordinate institutions to implement sectoral policy areas for which they are responsible, taxpayers mandate local councils to determine the amount of tax, central

authorities mandate decentralized services at local level, public institutions mandate their own employees, supplier contracting authorities etc.

The authors considered the public policy management as a process of establishing entities and systems that are meant to implement state's public policies and among which there are established specific relations to the agent theory.

For example, if we analyse issues exclusively from a decentralization point of view, according to the Council of Europe report - "Reforms of regionalization and decentralization in Romania", an efficient allocation of responsibilities between the central and local levels implies that the competencies regarding the implementation of strategies, policies, national laws and regulations to be exercised by the local public administration authorities, and the attributions for the elaboration of national strategies/policies, regulation, inspection and control on the manner in which the legal provisions in this field are complied with by the central public administration authorities.

Regarding the use of the agent theory, the above case evokes the existence of only two central and local levels. However, in practice, the decision is much more complex, involving the existence of several public sector credit authorizers, coordination structures and control at different agents level. The efficiency of competences allocation exercised by public authorities in a broad sense implies not only decentralization, which is merely a customization of a broader concept of building economically efficient mechanisms to achieve one or more objectives, but, as previously specified, the establishment of certain structures.

The study aims at defining a formal mechanism for analyzing the possibility of reaching the public policy objective (granting social benefit for poverty in the considered case) to a given structural context. Creating public policies takes into consideration the failure of markets and, as a consequence, the state has more or less coherent information. Market self-regulation mechanisms allow effective self-regulation, but market failure may lead to the need for state intervention even if it can only maximize some self-regulatory processes [32].

That is why it is important for the state to be concerned about finding those mechanisms and institutions that ensure certain efficiency. There has always been a question of allocation efficiency under conditions of informational asymmetry. "The economic problem of society is not just a matter of how to allocate resources, it is rather a question of how to ensure the best use of resources for purposes that are only relative to these individuals", Hayek, 1945 [33].

If we consider the benefit of social assistance for poverty, let's assume that in a hypothetical country public policy implies giving a sum of money to the income of a person or household and the wealth of the household itself. Suppose there are central institutions in the country that know the income, another central institution that pays transfers and local authorities. In practice, there is a negative income tax based on marking (labeling). The model is described by George Akerlof in *The Economics of "Tagging"*, which addresses the optimal charging model in a negative Mireless Fair tax with labeling [34].

Let's continue with this example and assume that due to the current development of the society, the local government has no access to real-time revenue data, these data being operative only by the central administration. At the local level, the material situation of the people is better known because of the fact that the leadership of the communities is much closer to the citizen. The state is involved in a public policy program that aims to increase the individual's own benefits and reduce poverty.

The payment in this hypothetical case is supported by the state (state budget) through the local institution without the person paying the indemnity (the state) knowing clearly and completely the situation of that person who will benefit only through a mandate contract with the city hall. Thus, there are two levels of transactions: one that is established between the applicant

and the city hall, and the other in the relationship between the city hall and the state. In this system of institutions there may be different mechanisms. Funds may be allocated for transfers directly to the mayoralty or directly from the state on the basis of an online application or a joint mechanism where a local agency pays the money on the basis of an opinion issued by the mayoralty. Which of these variants is optimal?

Based on the theory of Leonid Hurwicz [35] which started from the dilemma<sup>(2)</sup> described in ancient times by Juvenal, we can state that the mechanisms underlying the institutional design are certain types of games with incomplete (or asymmetric) information characterized by a "principal" who would like to condition his actions on information known to the other player (or other players) called the "agent" that the principal does not know.

With reference to information asymmetry we can say that this is the relationship between the hidden actions given by the productive "effort" of the agents, in the context of the hidden information that they hold as agents having an informational advantage over the principal [36]. In this respect, we can define a mechanism as a procedure whereby the principal constraints the agents to properly exercise the obligations arising from the standards, regulations and performance criteria defined in the standards [37].

Thus, considering the example above, local communities know better, but often incomplete, the real situation of their citizens. Although a citizen may seem poor, he/she may in fact have a better material situation assuming he/she would hold other assets unknown to the mayor. According to the hypothetical model, let us suppose that there is an institution which makes the payment of this benefit. These central institutions have confidence in the ability to verify the local institution (at the city halls level), but obviously not entirely because the mayors have their interests, too.

In the exerted management processes, the main actors in the relation with the agencies carry out a series of well-established and methodically developed processes and actions to ensure that the agents know, respect and adhere to the required professional norms and behavior, but also with the aim of increasing efficiency and effectiveness. So, for example, mayors may order in-house verification inquiries. These actions imply and involve adequate resources and appropriate costs that also lead to administration costs.

Returning to Juvenal's story, in this case, part of the award decision is delegated to the municipal social investigation authority (first agent or guardian) who knows better the real situation of another agent that may be a poor person or a whole family. Agents will only report honestly unless the principal provides an incentive to do so either through monetary payments or other non-financial instruments or benefits, and by the existence of a sanction policy. Thus, in the above example, mayors have an agent role and are subject to sanctioning levers defined by law (inspections), but also have specific benefits, such as electoral ones.

Since the provision of these incentives is costly, the principal is faced with a compromise that sometimes leads to inefficient allocation [38]. In an ideal world where the government would have all the relevant information, it would not be necessary to develop any mechanism because transfers can only be distributed based on central data. The state would simply allocate to every person entering this category the amount required in the account.

In the situation described, the state is only partially aware of the real situation, for instance from the databases it has at its disposal and does not know the indepth status of the person or the household, such as other assets that may lead to exclusion etc. The situation is not the same in the particular case of other transfer policies where, for example, the date of birth and possibly some elements of education found in the Ministry of Education databases can define a direct payment system without the payment mechanism going through local level decision. However, in some cases, for a complete knowledge of the real situation, an additional agent is needed in this situation at the local level.



A first conclusion is that the evolution of IT systems can lead to significant savings in administrative expenses but also to a reduction in the level of risks if some of the mechanisms are changed. Such a model was considered by authors in other studies in which the mathematical equilibrium of the game is presented [39]. If the model created in this article is compared to another model in which the state directly grants poverty aid to a person on the basis of an own-responsibility statement (if the structure of the actors is changed or other elements or rules), it is noticed that the balance changes and it is generated a new or higher game value.

Creating these models, analyzing and simulating them is a difficult process for the state decision maker and therefore it is important to be performed at least a preliminary analysis based on general principles of designing such mechanisms. This is especially necessary because there can often be changes in status and because there are needed several types of programs that work together [40].

Let us assume that due to technical progress in the field of information technology, a better knowledge of the income situation becomes possible, a possibility of easier data transmission between the local level and the central level, and the following year there is a major economic decline. For both events there needs to be a rapid evaluation tool that will result in effective measures which are subject to public policy.

In the following we will outline some principles that can be considered in organizational redesigns. The first principle is that in a contract in which there is an informational asymmetry, the efficiency of the mechanism is based on the penalties and rewards system [41]. Thus, for example, in granting social transfers, the higher the penalty, the less demanding the tendency for fraudulent solicitation. The imposition of very high penalties implies a more difficult enforcement and can either lead to their inapplicability or to a high misapplication (fear of punishment).

Another direction in streamlining mechanisms is to provide incentives that should help to make agents more efficient. Under the poverty transfer mechanism, it is appropriate to introduce sanctions both on the local level - the declarant level and on the central level, but also to introduce appropriate rewards such as, for example, additional funding for the municipalities where the inspectors found the smallest errors.

A second principle is that the information flow between actors must be as fast as possible and without very high costs. In this respect, in the example above, a massive transfer of data and matching between them can be used as an opportunity, which greatly reduces administration costs, although they require an initial investment in technology.

A third principle is that information asymmetry is reduced when signals from various actors are received. Thus, although the local level evaluates the state of a person's property, this can be done independently and by regularly consulting some data or information (petitioners, other institutions) from various third parties and establishing risk profiles. This principle starts from the fact that some people, including the guardians, have the ability and the inclination to discourage the inappropriate behavior of other lower-level guards. The mechanism is described very well in Hurwitz's work. The principal involves increasing the communication capacity of the beneficiaries or persons at lower decision levels directly to the central authority.

Compliance with this principle entails the outsourcing of processes taken to control the adverse effects of the mandate contract. For example, Phong (2012) proposes the use of external audit. In the public sector, for public institutions, the use of external auditing could be equivalent to recourse to the Court of Accounts auditors or other similar institutions, such as the existence of an independent inspection at the local level. But, at the same time, it may also be the use of internal audit organized at the level of the senior public sector credit supervisor.

A fifth principle is transparency that contributes to keeping moral hazard under control. As the financial aspects are better known and more public, detailed and transparent, the differences in information between principals and agents are reduced, the power of agents abuse being proportional to the size of information asymmetry. We find a panacea through the transparency instrument for better governance of public funds.

Faced with the above, we can build a multi-criteria aggregation model based on a scorecard [42], which will ensure the integration of the above principles by giving a note and significance to coefficients. For each  $V_x$  variant it is quantified the impact on the two  $I_{Jx}$  input indicators and the informational asymmetry principles.

Each value of the indicator is weighted by a coefficient having for each measure an amount equal to 1. Thus, we define the coefficients for Potential Output Growth Rate (weight 0.25) and Redistribution Effect (weight 0.75), each of which being proportional to those given by regression shown in Table 2 (0.75, 0.25). Similarly, the impact of informational asymmetry on the principals ( $P_{ix}$ ) is quantified, the sum of the index weights being also equal to 1. Each component will be assigned a  $cc_y$  coefficient (0.4 and 0.6 respectively), the sum of the coefficients being equal to 1.

Three options are being considered:

Option 1 (mixed) - two levels of administration: one central level and one local level. There is a lower level orderer of the principal order.

Option 2 (the beneficiary) - there is only one redistribution entity at central level.

Option 3 - there is only one redistribution entity at the local level.

**Figure 4.** Aggregation using a scorecard

Figure 4.18 Segregation using a scorecard

Component (component coefficient)	Principle (P <sub>ix</sub> ) / Indicator I <sub>Jx</sub>	Significance Coefficient C <sub>ix</sub>	Option 1 Mixed	Option 2 The beneficiary asks the state	Option 3 The beneficiary requests the local level
Influence on the information asymmetry principles					
Mechanisms of public policy transmission (0.4)	Penalty		Central level – lower level public credit authorizer - 6, Lower level public credit authorizer Local level - 6 Local level - beneficiary 8	Central level citizen - 5	Central level Local level - 5 Local level citizen - 3
		0.2	Average 6.67	5	4
	Rewards		Central level – lower level public credit authorizer - 8, Lower level public credit authorizer Local level - 6 Local level - beneficiary 8	Central level citizen - 0	Central level Local level - 5 Local level citizen - 3
		0.1	Average 6.67	0	4
	Flow of information		Central level – lower level public credit authorizer - 8, Lower level public credit authorizer Local level - 6 Local level - beneficiary 6	Central level citizen - 5	Central level Local level - 5 Local level citizen - 3
		0.3	Average 6.67	5	4
	Signals from various actors		Central level – lower level public credit authorizer - 8, Lower level public credit authorizer Local level - 6 City hall - beneficiary 6	Central level citizen - 6	Central level City hall - 5 City hall citizen - 3
		0.2	Average 6.33	5	4
	Transparency		Central level – lower level public credit authorizer - 8, Lower level public credit authorizer City hall - 5 City hall - beneficiary 5	Central level citizen - 5	Central level City hall - 5 City hall citizen - 3
		0.2	Average 6.33	5	4
Influence on input indicators					
Influence of input variables (0.6)	Participates in growth of Potential Output Growth Rate	0.25	8	5	3
	Participates at Redistribution Effect	0.75	5	7	5

**Source:** authors own research results.

The proposed model solution is given by the maximum:  $cc_y \sum (ci_x \times V_{ix}) + cc_y \sum (ci_y \times V_{jx})$ .

After the solution is identified, the positive cost-test response is determined, which is conditioned by the total cost of implementing the variance over the approved budget. The proposed methodology will allow for an appendix containing a similar analysis to be drawn up in drafting the normative act. When a government analyzes the state of affairs, it will find out what actually were the assumptions underlying the construction of a certain governance mechanism as defined by the law and will be able to reevaluate the impact of some indicators in the future improvements of the legislation.

## Conclusions

The study created an algorithm for rapid and formal analysis of the implementation of a social assistance program starting from the public policy goals and developing a simple mechanism for analysis and decision making.

The analysis covered two parts. The first part addresses the dependence of certain output indicators related to social policies on other relevant input indicators. For this stage the authors proposed a data mining algorithm. In the second part the authors used the mechanism design theory principles and analyzed the implications of the mechanism design in public management. Each of the two components were aggregated using a scorecard that allows a simple and formal analysis of the decision.

The creation of an analysis model for transfer mechanisms through agent and data mining theory facilitated the explanation of certain phenomena that can be identified in the institutional projection phase as well as the determination of the impact of some components on poverty reduction. Thus, the paper confirmed the importance of redistributing income in social policy design. Defining a formal enforcement mechanism makes it possible for reorganisations in the public sector which can be accompanied by transparent and appropriate substantiation.

The limitations of the study are given by the methods used, including data mining techniques and inherent subjectivity of decision-makers.

The model can be extended to other areas of social assistance policies and institutional reorganization if governments are looking to streamline the public administration. The model will be complemented to incorporate other data mining models.

---

## Notes

- (1) The variation of an indicator is given by the difference between the value of the indicator in the reference year and the indicator (k) represents the difference of the second order.
- (2) A senator, guessing that his wife cheated him, put a team of soldiers to guard her. Not having enough confidence in them, he also put in a series of guards that were meant to guard the soldiers. This is where the question arises: But who will guard the guardians?

## References

- Akerlof, G., 1978. The Economics of 'Tagging' as Applied to the Optimal Income Tax, Welfare Programs, and Manpower Planning, *American Economic Review*, 68(1).
- Akerlof, G. and Kranton, R., 200. Economics and Identity, *The Quarterly Journal of Economics*, Vol. 115, Issue 3, pp. 715-753.
- Alkire, S. and Foster, J., 2008. *Counting and multidimensional poverty measurement*, Oxford Poverty and Human Development Initiative, University of Oxford, Oxford.
- Antony, G.M. and Rao, K.V., 2007. A composite index to explain variations in poverty, health, nutritional status and standard of living: Use of multivariate statistical methods, *Public Health*, 121, 578-587. doi:10.1016/j.puhe.2006.10.018
- Arrow, K.J., 1950. A Difficulty in the Concept of Social Welfare, *Journal of Political Economy*. 58 (4), pp. 328-346.
- Aumann, R., 1974. Subjectivity and correlation in randomized strategies, *Journal of Mathematical Economics*. 1 (1), pp. 67-96. doi:10.1016/0304-4068(74)90037-8.
- Baron, D. and Besanko, D., 1984. Regulation, Asymmetric Information, and Auditing, *RAND Journal of Economics*, Vol. 15, No. 4, pp. 447-70.
- Barro, R.J., 1990. Government Spending in a Simple Model of Endogenous Growth, *Journal of Political Economy*, University of Chicago Press, 98 (5), S103-26, October.
- Bossert, W., Chakravarty, S.R. and Ambrosio, C.D., 2009. *Measuring multidimensional poverty: The generalized counting approach*, The Social Sciences and Humanities Research Council of Canada, Ottawa.
- Bourguignon, F. and Chakravarty, S., 2003. The measurement of multidimensional poverty, *Journal of Economic Inequality*, 1, pp. 25-49.
- Gibbard, A., 1973. Manipulation of voting schemes: A general result, *Econometrica*. 41 (4): pp. 587-601. doi:10.2307/1914083. JSTOR 1914083.
- Grossman, S. and Hart, O., 1983. An analysis of principal agent problem, *Econometrica*, 53(1), pp. 1357-1368.
- Han, J. and Kamber, M., 2006. *Data mining: Concepts and techniques*, 2nd Edition, Morgan Kaufmann Publishers, San Francisco.
- Harsanyi, J.C., 1967-1968. Games with Incomplete Information Played by Bayesian Players, *Management Science*, 14, pp. 159-182, 320-334, and 486-502.
- Hayek, F.A., 1945. *The Use of Knowledge in Society*, *American Economic Review*. XXXV, No. 4. pp. 519-30. American Economic Association.
- Hillman, A.L., 2003. *Public Finance and Public Policy*, Cambridge: Cambridge University Press.
- Holmstrom, B., 1977. *On Incentives and Control in Organizations*, Unpublished Ph.D. dissertation, Graduate School of Business, Stanford University.
- <<http://www.sgi-network.org/2017/>> [accessed on 20.12.2017]
- <[http://www.sgi-network.org/2017/Policy\\_Performance/Social\\_Policies/Social\\_Inclusion/Poverty\\_Rate](http://www.sgi-network.org/2017/Policy_Performance/Social_Policies/Social_Inclusion/Poverty_Rate)>
- Hurwicz, L., 1973. The design of mechanisms for resource allocation, *The American Economic Review*, special issue: papers and proceedings of the eighty-fifth annual meeting of the American Economic Association, (Richard T. Ely Lecture), American Economic Association via JSTOR. 63 (2), pp. 1-30. JSTOR 1817047.
- Hurwicz, L., 2008. But Who Will Guard the Guardians?, *American Economic Review*, American Economic Association, Vol. 98(3), pp. 577-585.
- Hurwicz, L., Schmeidler D. and Sonnenschein, H., 2005. *Social Goals and Social Organization*, Essays in Memory of Elisha Pazner, Cambridge University Press, Cambridge.
- Kaplan, R.S. and Norton, D.P., 1996. *The Balanced Scorecard: Translating Strategy into Action*, Boston, MA.
- Khalil, F. and Lawarrée, J., 2001. Catching the agent on the wrong foot: ex post choice of monitoring, *Journal of Public Economics*, Elsevier, Vol. 82(3), pp. 327-347.
- Laffont, J.J., 1987. *Incentives and the Allocation of Public Goods*, in: Alan J. Auerbach and Martin Feldstein, eds., *Handbook of public economics*, Vol. 2, Amsterdam: North Holland, pp. 537-69.
- Margahny, M.H. and Mitwaly, A.A., 2005. *Fast algorithm for mining association rules*, Proceedings of the Artificial Intelligence and Machine Learning 05 Conference, pp. 19-21.
- Maskin, E.S., 2007. *Prize Lecture by Eric S. Maskin*, Nobel Media AB, Nobel Prize.
- Muro, P.D., Mazziotta, M. and Pareto, A., 2009. Composite indices for multidimensional development and poverty: An application to MDG indicators, University of Roma Tra, Rome.
- Musgrave, R.A., 1959. *The Theory of Public Finance*, New York: McGraw-Hill.

- Myerson, R., 1978. Refinements of the Nash equilibrium concept, *International Journal of Game Theory*, 7, pp. 73-80.
- Olson, D.L. and Delen, D., 2008. *Advanced data mining techniques*, Springer, New York.
- Piketty, T., 2014. *Capital in the Twenty-first Century*, Harvard University Press, Cambridge, Massachusetts.
- Sen, A., 1976. Poverty: An ordinal approach to measurement, *Econometrica*, 44, pp. 219-231. doi:10.2307/1912718.
- Shavell, S., 1979. Risk Sharing and Incentives in the Principal and Agent Relationship, *The Bell Journal of Economics*, Vol. 10(1), pp. 55-73.
- Silber, J., 2007. Measuring poverty: Taking a multidimensional perspective, *Hacienda Publica Espanola / Revista de Economia Publica*, 182, pp. 29-73.
- Stiglitz, J., 1998. Distinguished lecture on economics in government. The private uses of public interests: incentives and institutions, *Journal of Economic Perspectives*, 12(2), pp. 3-22.
- Vintilescu, A., 2014. On a model of designing effective social assistance program, *Theoretical and Applied Economics*, International Finance and Banking Conference FI BA.
- Vintilescu, A., 2015. Mechanisms to optimize expenditure on social protection, *Theoretical and Applied Economics*, International Finance and Banking Conference FI BA.
- Vintilescu, A. and Corches, L., 2013. *A mechanism for the allocation of social assistance expenditure in times of economic crisis*, Proceedings of the 7th international management conference "New management for the new economy", Bucharest, Romania.
- Vintilescu, A. and Corches, L., 2014. Designing Social Programs in Circumstances of Informational Asymmetry, *Economics World*, ISSN 2328-7144, Vol. 2 (1), pp. 11-24.
- Word Bank World Development Report 2000/2001 Attacking Poverty.

**Annex 1. Dataset with the assessed indicators**

Domain / Indicator			
<b>Policy Performance</b>	<b>Education</b>	<b>Environmental Policies</b>	GO Expertise
<i>Rank among 41 countries</i>	Education Policy	<i>Rank among 41 countries</i>	GO Gatekeeping
<b>Economic Policies</b>	Upper Secondary Attainment	<b>Environment</b>	Line Ministries
<i>Rank among 41 countries</i>	Tertiary Attainment	Environmental Policy	Cabinet Committees
<b>Economy</b>	PISA results	Energy Productivity	Ministerial Bureaucracy
Economic Policy	PISA, Socioeconomic Background	Greenhouse Gas Emissions	Informal Coordination
GDP per Capita	Pre-primary Expenditure	Particulate Matter	<b>Evidence-based Instruments</b>
Inflation	<b>Social Inclusion</b>	Water Usage	RIA Application
Gross Fixed Capital Formation	Social Inclusion Policy	Waste Generation	Quality of RIA Process
Real Interest Rates	Poverty Rate	Material Recycling	Sustainability Check
Potential Output, Growth Rate	NEET Rate	Biodiversity	<b>Societal Consultation</b>
<b>Labor Markets</b>	Gini Coefficient	Renewable Energy	Negotiating Public Support
Labor Market Policy	Gender Equality in Parliaments	<b>Global Environmental Protection</b>	<b>Policy Communication</b>
Unemployment	Life Satisfaction	Global Environmental Policy	Coherent Communication
Long-term Unemployment	<b>Health</b>	Multilateral Environmental Agreements	<b>Implementation</b>
Youth Unemployment	Health Policy	Kyoto Participation and Achievements	Government Efficiency
Low-skilled Unemployment	Spending on Health Programs	<b>Quality of Democracy</b>	Ministerial Compliance
Employment Rate	Life Expectancy	<i>Rank among 41 countries</i>	Monitoring Ministries
Low Pay Incidence	Infant Mortality	<b>Electoral Processes</b>	Monitoring Agencies, Bureaucracies
<b>Taxes</b>	Perceived Health Status	Candidacy Procedures	Task Funding
Tax Policy	<b>Families</b>	Media Access	Constitutional Discretion
Tax System Complexity	Family Policy	Voting and Registration Rights	National Standards
Structural Balance	Child Care Density, Age 0-2	Party Financing	<b>Adaptability</b>
Marginal Tax Burden for Businesses	Child Care Density, Age 3-5	Popular Decision-Making	Domestic Adaptability
Redistribution Effect	Fertility Rate	<b>Access to Information</b>	International Coordination
<b>Budgets</b>	Child Poverty	Media Freedom	<b>Organizational Reform</b>
Budgetary Policy	<b>Pensions</b>	Media Pluralism	Self-monitoring
Debt to GDP	Pension Policy	Access to Government Information	Institutional Reform
Primary Balance	Older Employment	<b>Civil Rights and Political Liberties</b>	<b>Executive Accountability</b>
Debt Interest Ratio	Old Age Dependency Ratio	Civil Rights	<i>Rank among 41 countries</i>
Budget Consolidation	Senior Citizen Poverty	Political Liberties	<b>Citizens' Participatory Competence</b>
<b>Research and Innovation</b>	<b>Integration</b>	Non-discrimination	Policy Knowledge
R&I Policy	Integration Policy	<b>Rule of Law</b>	Voicing Opinion to Officials
Public R&D Spending	FB-N Upper Secondary Attainment	Legal Certainty	Voter Turnout
Non-public R&D Spending	FB-N Tertiary Attainment	Judicial Review	<b>Legislative Actors' Resources</b>
Total Researchers	FB-N Unemployment	Appointment of Justices	Parliamentary Resources
Intellectual Property Licenses	FB-N Employment	Corruption Prevention	Obtaining Documents
PCT Patent Applications	<b>Safe Living</b>	<b>Governance</b>	Summoning Ministers
<b>Global Financial System</b>	Safe Living Conditions	<i>Rank among 41 countries</i>	Summoning Experts
Stabilizing Global Financial Markets	Homicides	<b>Executive Capacity</b>	Task Area Congruence
Tier 1 Capital Ratio	Thefts	<i>Rank among 41 countries</i>	Audit Office
Banks' Nonperforming Loans	Confidence in Police	<b>Strategic Capacity</b>	Ombuds Office
<b>Social Policies</b>	<b>Global Inequalities</b>	Strategic Planning	<b>Media</b>
<i>Rank among 41 countries</i>	Global Social Policy	Scholarly Advice	Media Reporting
<b>Education</b>	ODA		Newspaper Circulation
			Quality Newspapers
			<b>Parties and Interest Associations</b>
			Intra-party Democracy
			Association Competence (Business)
			Association Competence (Others)

Source: <http://www.sgi-network.org/2017/>

## Annex 2. Countries analyzed

Australia, Austria, Belgium, Bulgaria, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

## Annex 3. Regression analysis dataset

2016

Country	Poverty Rate	Redistribution Effect	Potential Output Growth Rate
Romania	2,06004619	3,966199432	5,753190255
Israel	2,26789838	2,778122782	6,13950116
United States	2,72517321	3,202892122	4,416763341
Chile	3,01616628	1	6,51537123
Mexico	3,05773672	1	5,810614849
Japan	3,30715935	4,790188077	4,328016241
Turkey	3,34872979	1	9,882540603
Bulgaria	3,39030023	4,258427963	6,760730858
Spain	3,39030023	5,079222853	3,597157773
Greece	3,43187067	4,266412349	1,681264501
SouthKorea	4,01385681	1,446327182	5,048433875
Portugal	4,26327945	3,047995032	4,093097448
Croatia	4,4295612	3,854418027	2,887180974
Latvia	4,51270208	2,976135557	4,474187935
Estonia	4,59584296	3,701117814	4,17662413
Australia	4,67898383	4,446859475	4,270591647
Italy	4,72055427	5,721167495	3,231728538
Canada	4,76212471	3,883161817	3,503190255
Lithuania	5,30254042	3,233232789	4,160962877
NewZealand	5,46882217	3,52546132	5,032772622
Poland	5,55196305	6,088449255	4,844837587
Germany	5,63510393	5,610982967	4,735208817
UnitedKingdom	6,05080831	6,428584102	4,171403712
Hungary	6,17551963	7,616660752	5,36687935
Slovenia	6,21709007	7,239797729	4,098317865
Ireland	6,34180139	5,432132718	10
Belgium	6,42494226	7,115241306	3,99912993
Sweden	6,4665127	7,884936125	5,356438515
Malta	6,50808314	5,412970192	5,909802784
Slovakia	6,50808314	6,109208659	5,267691415
Austria	6,59122402	6,184261888	4,281032483
Luxembourg	6,63279446	5,716376863	5,121519722
Cyprus	6,75750577	3,763396026	2,443445476
Switzerland	6,75750577	6,094836764	3,377900232
France	7,2147806	6,846965933	3,774651972
Denmark	7,25635104	7,199875798	4,145301624
Norway	7,42263279	8,964425124	2,652262181
Netherlands	7,54734411	6,048527324	3,597157773
Finland	7,71362587	8,253814762	3,769431555
CzechRepublic	7,83833718	7,185503903	4,401102088
Iceland	8,37875289	8,659421576	8,055394432

**Source:** authors own research results.

**2017**

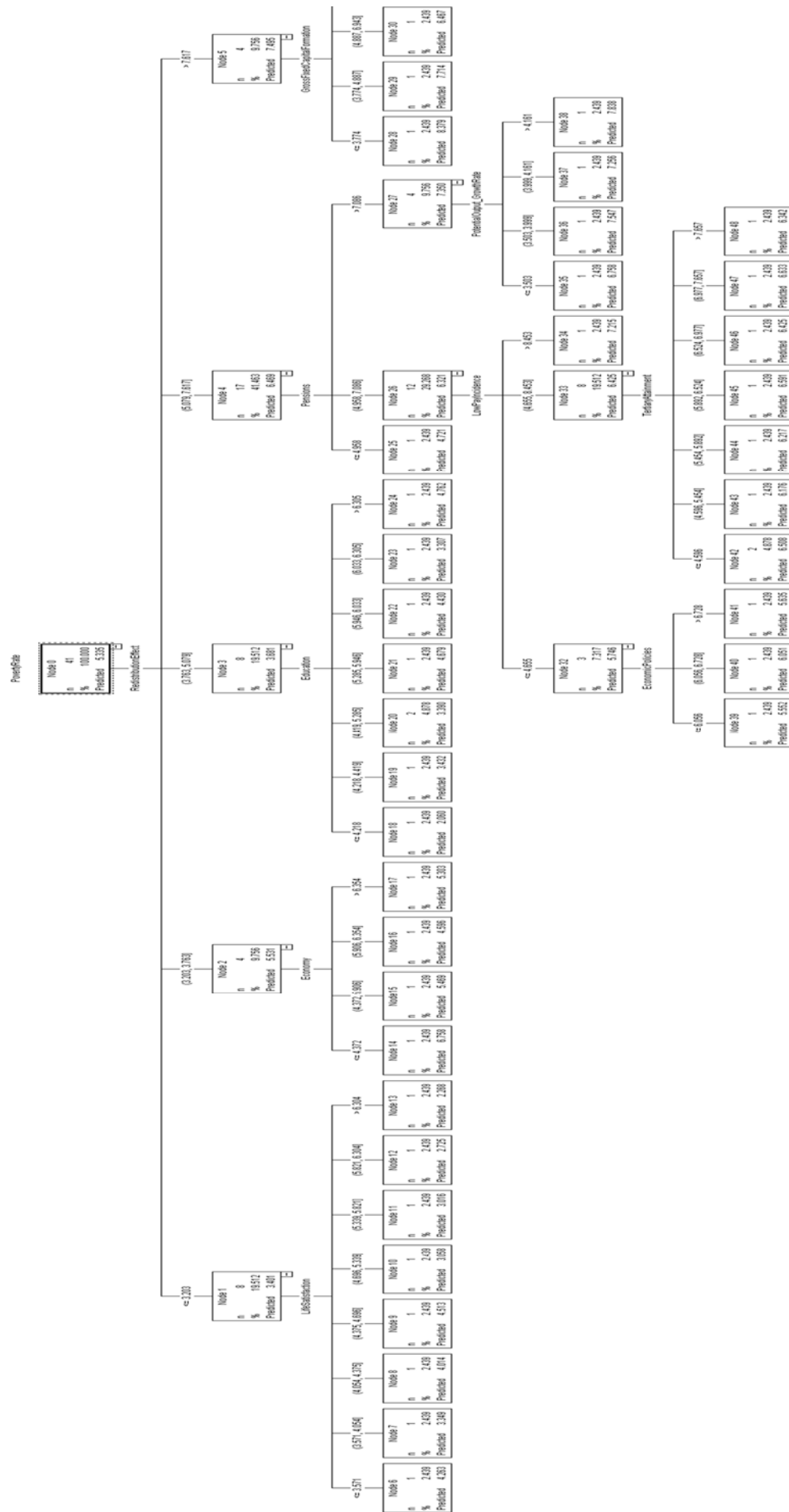
Country	Poverty Rate	Redistribution Effect	Potential Output Growth Rate
Israel	1,89376443	2,813254081	5,325116009
Romania	2,01847575	3,127838893	5,617459397
UnitedStates	2,72517321	3,279542229	4,479408353
Mexico	3,05773672	1	6,781612529
Bulgaria	3,1408776	3,97897445	5,83149652
Chile	3,30715935	1	6,22824826
Japan	3,30715935	4,790188077	3,461426914
Turkey	3,34872979	1	9,38138051
Spain	3,55658199	5,050479063	3,633700696
Greece	3,63972286	4,541075231	2,652262181
Latvia	4,01385681	3,413679915	4,082656613
Lithuania	4,01385681	2,378903478	5,137180974
Portugal	4,26327945	2,442778566	3,920823666
SouthKorea	4,26327945	1,773687012	5,011890951
Italy	4,4295612	6,184261888	3,330916473
Croatia	4,51270208	4,010911994	3,289153132
Australia	4,67898383	4,446859475	4,421983759
Canada	4,76212471	3,883161817	4,103538283
Estonia	4,80369515	3,899130589	4,792633411
NewZealand	5,46882217	3,52546132	6,149941995
Poland	5,55196305	6,289655784	4,108758701
Germany	5,75981524	5,601401703	4,380220418
UnitedKingdom	5,96766744	6,316802697	4,938805104
Sweden	6,09237875	7,953601845	4,729988399
Cyprus	6,25866051	4,846078779	2,704466357
Switzerland	6,30023095	6,233765082	3,236948956
Ireland	6,34180139	5,821770759	4,354118329
Belgium	6,42494226	7,035397445	4,385440835
Malta	6,4665127	5,641323634	6,343097448
Luxembourg	6,59122402	5,868080199	5,377320186
Slovenia	6,59122402	7,356369766	3,926044084
Austria	6,63279446	6,211408801	4,046113689
Slovakia	6,63279446	6,997072392	4,562935035
Hungary	6,75750577	7,380322924	5,450406032
Norway	7,13163972	8,758427963	3,106438515
Denmark	7,17321016	7,057753726	4,098317865
Netherlands	7,2147806	5,885645848	4,281032483
France	7,29792148	6,351933996	3,88950116
Iceland	7,71362587	8,167583392	7,173143852
CzechRepublic	7,79676674	7,257363378	4,808294664
Finland	7,9630485	8,293736693	3,461426914

**Source:** authors own research results.



# Annex 4. CHAID Decision Trees

## 2016



**Source:** authors own research results.



**Source:** authors own research results.

# How do unemployment benefits and minimum wage affect poverty?

**Cristina Irina PARASCHIV**

????

cristina\_irina\_paraschiv@yahoo.com

**Abstract.** *The instruments used anti-poverty-wise by governments and authorities in a direct manner are restricted to the economic tools such as the minimum wage system or the unemployment benefits. Although these instruments have a beneficial effect in the majority of cases, the abuse or misuse of said mechanisms can and would generate the exact opposite effect on the poverty-stricken population. The beneficial effects account towards the reintegration of the populace within the labour market, by securing a form of household income and by protecting the under-paid employees against the risk of falling into poverty as well as abuse and exploitation. These instruments need to be updated to undertake the new intricacy of dimensions that compose poverty, as seen nowadays. An in depth analysis of the phenomenon and the ramifications of its effects and causes is required to come up with other ways and instruments to help lessen its outcomes, combined with a change in perspective and focus over the classical instruments towards a better welfare of the populace. This paper studied the correlation that might exist between the indicators that reflect the phenomenon of poverty and the instruments used by the government to decrease its incidence and intensity such as unemployment benefits (insurance or assistance) and the minimum wage within the EU 28 countries in a ten year timeframe (from 2006 to 2015).*

**Keywords:** poverty, minimum wage, unemployment benefits, European Union.

**JEL Classification:** J31, J80, I32, I38, E24.

## Introduction

Poverty, with all its complexity and intricacy is important to be properly defined in order to assist authorities towards building and revising better, and more efficient financial policies within their economic system. This difficult task revolves around the most widespread definition of poverty, and that is, according to the World Bank, whatever comes just short of a "*socially acceptable general standard of living*"<sup>(1)</sup>. Although poverty is mostly viewed as a lack of capability, either a lack of resources or material goods, either a lack of services towards achieving a minimum living standard, it can also be defined as a whatever falls just short of a socially acceptable standard of living within the population in question.

Administrations are aware of the phenomenon of poverty and the negative effects it has economical and political-wise, thus they find themselves struggling to combat and diminish its grip on the citizens. The tools most countries commonly possess against poverty are the economical benefits that governments offer to its citizens in order to decrease the effects of the phenomenon. The main reasons poverty occurs in an individual's life is the lack of employment or the unsatisfactory wages offered to the workers on the labour market. Thus, the governments took into account the necessity to regularize the labour market conditions, deciding towards the introduction of a form insurance for the citizens that find themselves in risk of unemployment by offering them benefits based on the fees provided while being employed or, in case of long term unemployment, the unemployment assistance came into stage as a financial help. The unemployment assistance and its beneficiaries have been extensively debated as these funds need be sufficient enough to help poor people live and sustain themselves within the society and, at the same time, mustn't be high enough to stop people being motivated to return to the labour market and start working. Regarding the minimum wage, this financial tool is not used all over the European Union and its effects were not clearly demonstrated within the empirical analysis.

This paper tries to answer the question if "do unemployment benefits or minimum wage help with the lessening of the incidence or the intensity of poverty?". The subject was chosen because of the actuality and the relevance of the theme, as nowadays all governments struggle to fight poverty and make use of financial mechanisms in order to minimize the effects of the phenomenon. This paper clearly demonstrates the redistributive attribute of the financial funds held by the state. If we are talking about the unemployment insurance, for example, the employees pay a fee in case they will face the risk of unemployment. In case this situation occurs, said unemployed individuals benefit from those funds.

This paper was constructed to follow the logic of any research thesis, starting with the published literature that discourses on the chosen subjects and using graphic analysis in order to see the correlations between the indicators studied at a theoretical level within the EU 28 countries in 2016. The second part consists of three multiple regressions, built as panel data series that try to make an empirical analysis of the indicators chosen as dependent series (poverty indicators) and independent series (indicators referring to unemployment or minimum wage). The last part encompasses the conclusions of the study, which try to present and analyze the results of the entire research paper in a synthetic way, in order to clearly exhibit the effects and the impact that government interventions have on the poverty phenomenon.

## Literature review

It has been more than 100 years since Rowntree published what was called “*the first quasi-scientific empirical study*”<sup>(2)</sup> of poverty. In his study, he proposed a new way of conceptualizing, defining and measuring poverty by establishing a reference point based on a poverty line that was created by defining the cost of a diet and the allocation of funds for purchasing fuel and clothing. This study inspired not just the following published literature, but was also able to influence the governments into taking actions to define poverty, create an appropriate poverty line, measure the real value of income available to the people and refer to the well-being of the citizens within a nation.

Theoretical explanations regarding the definitions of poverty, the ways of measuring this phenomenon or the efficiency of the programs proposed by the governments to alleviate it have been widely discussed and updated with the social dimension of this phenomenon aside from the economical standpoint since (Sen, 1974) developed the approach of using a set of axioms in order to determine, measure and evaluate the sensitive distributions of the poverty measurement. This approach was focused on showing the existing relationships between the existent poverty measures and the reality of the candidates that could be considered poor, both individuals or households. In fact, Sen proposed an index that was meant to monitor the combined effects of the incidence of poverty, the intensity of this phenomenon and the distribution of poverty within a specific group. It was the first time when an indicator for poverty measurement took the income distribution among a particular group into consideration. In fact, this indicator focused its attention into showing the existing inequality between poor people by taking into consideration the degree of deprivation among them that leads to showing another reality of this phenomenon than that of the lack of income and/or assets.

In latest years, the poverty measures followed mostly the same pattern of measuring the income inequality or household consumption, without paying attention to the social welfare and well-being of the citizens within a nation. Based on a simple and comprehensive definition provided by (World Bank, 2001: pp.1), the poverty can be understood as a “pronounced deprivation in well-being”.

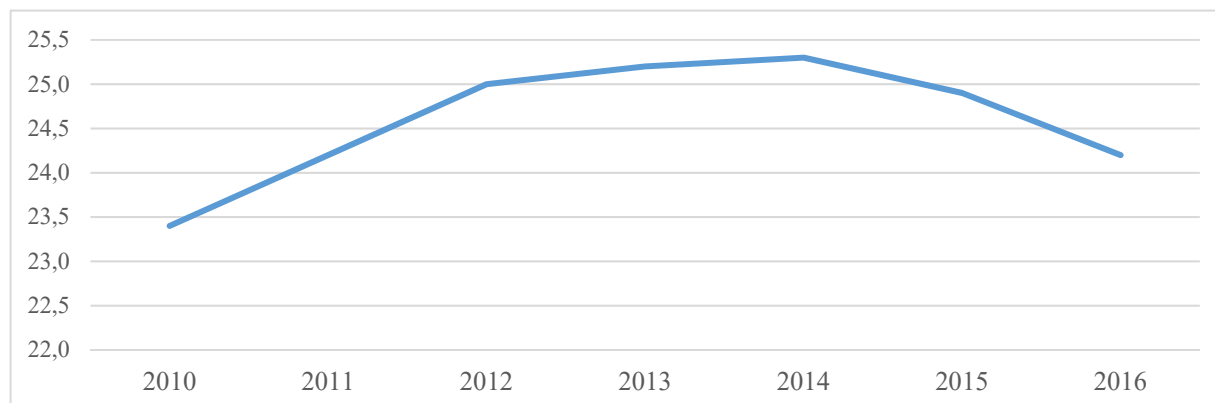
In fact, based on this relative and sensitive approach of poverty, a well determined definition of poverty cannot be provided, as it depends on various topics as: who asks and who answers, how this question is understood- (UNDP, 2006), which are its effects, which are its causes, how it is felt, and much more topics that must be well understood and determined in order to make governmental actions towards poverty alleviation more efficient.

Nowadays, “*administrations are judged by their success or failure in reducing the officially measured prevalence of poverty*”- (Tobin, 1969: pp.83). Based on this affirmation, it becomes clearer why the pressure of defining and measuring poverty is profoundly felt at a governmental level as “*the adoption of a specific quantitative measure, however, arbitrary and debatable, will have durable and far-reaching consequences*”- (Tobin, 1969: pp.83).

As the poverty phenomenon gets more complex, the governments must fight against it by efficiently monitoring its causes, its effects and the changes that were registered after the administration's interventions into this social factor that affects the prosperity of a nation. As well-being is becoming a subject more debated and got related to the “*capability of a person to function in the quotidian society*”- (UNDP, 2006: pp. 3), it is mandatory that the financial and social instruments used by governments to fight poverty should be updated to the current reality. As the abundance of areas involved by this phenomenon are becoming more intricate, the governments must update the instruments that can be used as one cannot hope to obtain different outputs based on the same input- (Polak and Warwick, 2013: pp.34).

The following chart presents the poverty tendency between 2010 and 2016 as per the average value of European Union 28 countries. Based on the graph below, one can state that the poverty rate was highest in 2014, at a level of about 25.3%, and lowest in 2010 when it reached the level of 23.4%. Although the difference between the minimum and the maximum value is less than 2 percentage points, the poverty trend was not constant. Between 2010 and 2014, the poverty rate slope was ascending, while, starting with 2015, the indicator started to fall, reaching 24.2% in 2016. Although in the last period of the studied timeframe the poverty rate was lower, almost a quarter of the people living in the European Union 28 are in risk of poverty or social exclusion.

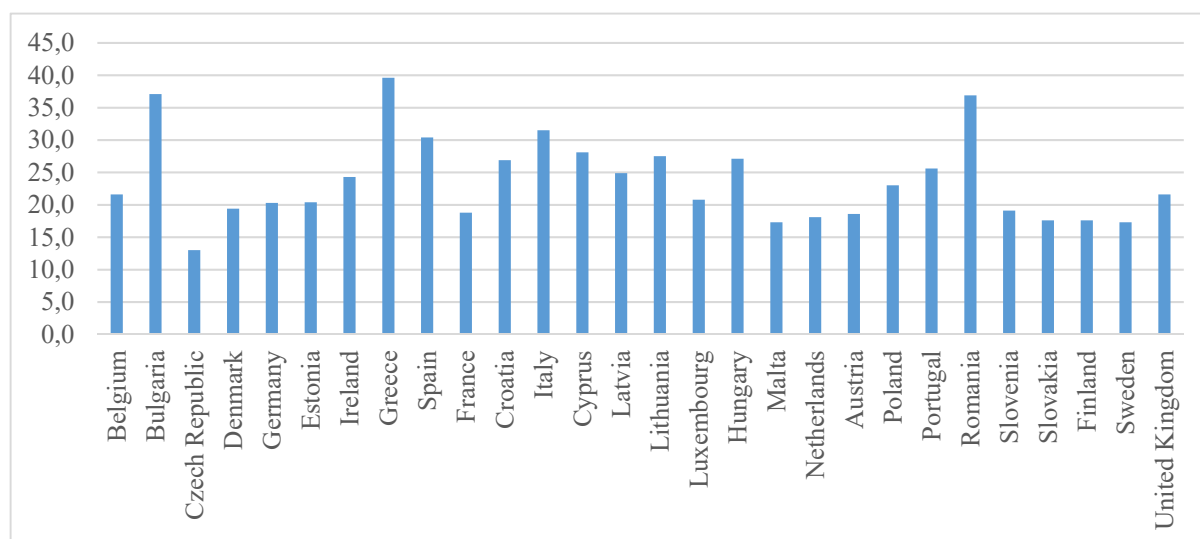
**Graph 1.** *The evolution of poverty rate between 2010 and 2016 in the EU 28 countries*



**Source:** made by the author based on Eurostat database

Based on the previous diagram that shows the dynamic and the evolution of the poverty rate, it would be interesting to discover how the poverty rate is dispersed between the subjects, thus the second graph based on the poverty rate level in the EU 28 countries in 2016 would be useful.

**Graph 2.** *Poverty rate level in 2016 across the EU 28 countries*



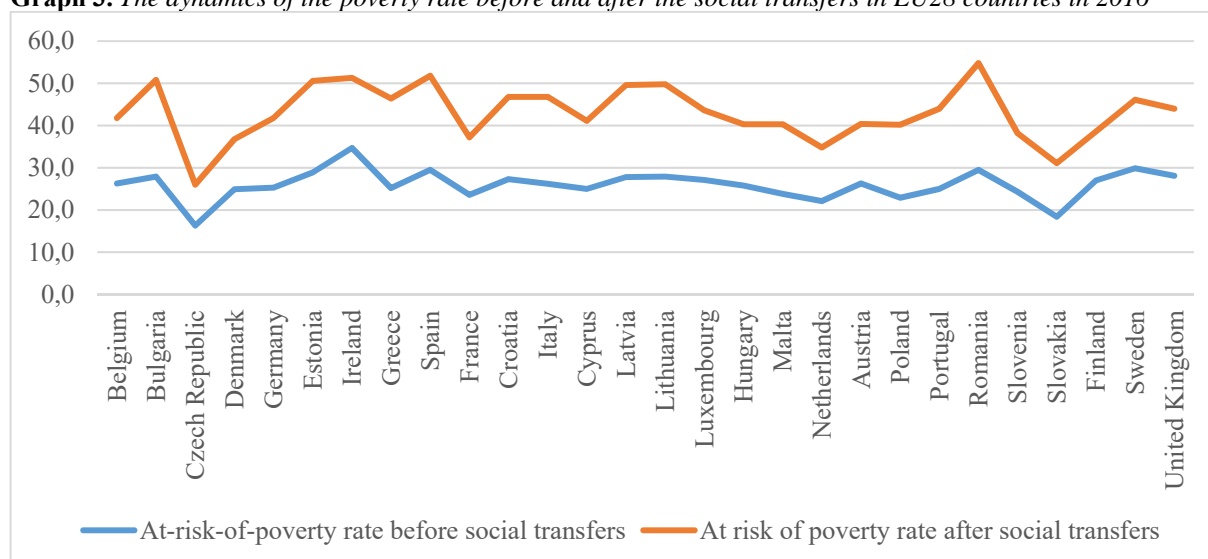
**Source:** made by the author based on Eurostat database

From the previous graph, one could deduce that the maximum poverty rate in the EU 28 countries, was found in Greece in **2018** with a level of about 39.6%. This figure can be a result of the economic crisis that hit Greece in the latest years. Very close to Greece are Bulgaria and Romania with a poverty level reaching at about 37.1% and 36.9% in 2016. The lowest poverty rate level in the EU28 countries in 2016 can be found in the Czech Republic

with a 13% rate, followed closely by the northern countries: Sweden and Finland. Slovakia has another meaningful poverty rate at about 17.3% and 17.6%.

It is common knowledge that the European Union tries to fight back this phenomena on by using subsidies offered by governments in order to help poor people break out of poverty or, at least, decrease poverty intensity. The following diagram shows the risk of poverty rate before and after the transfers of benefits from the governments to the beneficiaries in the EU28 countries in 2016.

**Graph 3.** *The dynamics of the poverty rate before and after the social transfers in EU28 countries in 2016*



**Source:** made by the author based on Eurostat database

The antecedent graph displays the dynamic and the evolution of the poverty rate before and after the social transfers provided by the governments were done.

As mentioned before, in 2016, the maximum poverty rate after the social transfers were done can be found in Greece and the lowest in the Czech Republic. It would be interesting to analyze the poverty rates of these countries before the social transfers were issued. Based on the Eurostat data, the Czech Republic's active instruments in the fight against poverty are the most effective even if the amount of people that are at risk of poverty and social exclusion before the transfers were done is taken into consideration. The country that has the greatest incidence of poverty before the social subsidies is Ireland, with a level of 34.7%, followed closely by Greece and Romania with 29.5%. In the analysis of the poverty rate before and after social transfers occur, it is interesting to disclose which country has the highest gap between the previously mentioned indicators, as this nation's support to the poor people is the greatest. This praise was attributed in 2016 to Ireland with a 18.1 percentage points gap, followed by Finland with a 15.4 percent. At the opposite side, there is Greece with a difference of 4 percentage points followed by Romania with a gap of 4.2%.

In the struggle towards finding the most accurate measure of poverty that can be correctly and coherently applied and targeted in order to obtain the most valuable effect with a certain given amount of resources, it has been found that the governmental intervention in the labour market was necessary, not just by providing a set of laws to protect both the employer and the employee, but also to protect the short term and long term unemployed individuals.

The unemployment benefits represent one of the most important features in the all European welfare systems- (European Commission, 2017). In order to assure the socio-economic sustainability of a nation, the governments assure a certain amount of protection to all the

vulnerable groups (such as the elder, the children, the poor, the unemployed, the disabled and any other disadvantaged groups). In this case, the protection against the risk of becoming jobless of a person, became a socio-financial instrument in government policies towards eradicating poverty- (Saunders , 2002), (Cousins, 2007).

Because of the lower returns in capital of an unemployed person, his and his household's income and assets are depreciating resulting in a lower purchase power of other assets, this translates into a risk towards the incapacity of the individual's proper functioning in the society and the person might become affected by the phenomenon of poverty- (Martinez et al., 2001: pp.3).

Apart from the classic purpose of unemployment benefits of being assurances for people who don't have a job, they also act as "*automatic stabilizers in the business cycle*"- (European Commission, 2017: pp.6), as they are also meant to support people who did not voluntarily quit a job and are currently in the process of finding employment. In the case of an involuntary loss of a job, the unemployment benefits sustain their main purpose of providing sufficient funds to people who's capital diminished abruptly. On the flip side, if individuals willingly abandon their jobs on purpose, becoming in fact job seekers, unemployment benefits are used as an instrument of economic growth.

Apart of the benefits of the unemployment insurances provided by the government, there are also some disadvantages. In case the amount received as unemployment benefit is high and it's received over a long period of time, this, in fact, can reduce people's incentive to rejoin the labour market as an active person- (Craig and McKeown, 1993), (Bond ,1994), causing negative effects on both a macroeconomic level as the total amount of persons unemployed, that could affect the long term efficiency and sustainability of the systems created for offering social assistance and social protection- (European Commission, 2017), but also on a microeconomic level as people could find themselves from voluntarily unemployed to not being able to obtain a job despite their initiative, thus becoming susceptible to being affected by the phenomenon of social exclusion- (Combat Poverty Agency, 1999).

(Stovicek and Turini, 2012) classified the unemployment benefits into two forms: the insurance and the assistance for unemployment.

The unemployment insurance is a financial instrument used by the governments in poverty alleviation programs, existing in all the Member States, that consists of an appropriate amount of income that a particular person can benefit based on the contributions of that individual. That resulted in a minimum period of paid contribution while the person was employed in order to receive this benefit. Its amount and duration is calculated proportionally to the amount earned by the employee in the last job, but also based on the duration in which the person was employed and paid the contributions.

The unemployment assistance funds are provided to the people who are not unemployed, but are not/no longer eligible to receive the unemployment insurance. Its level is lower than that of the unemployment insurance as to sustain people's initiative and incentive to work and remain active, whilst avoiding the moral hazard that would result in a decreased effort in searching for employment or even the destabilization the labour market- (Mortensten, 1970).

In fact, if the unemployment insurance is meant to provide consumption smoothing after losing employment and so diminishing the immediate effect upon the total available income of the household, also sustaining job searching while not being directly involved in the labour market. The unemployment assistance tries to help people live with dignity in the actual social market conditions, but also to be capable of being reintroduced into the labour market, so that they won't find themselves in risk of social exclusion or material

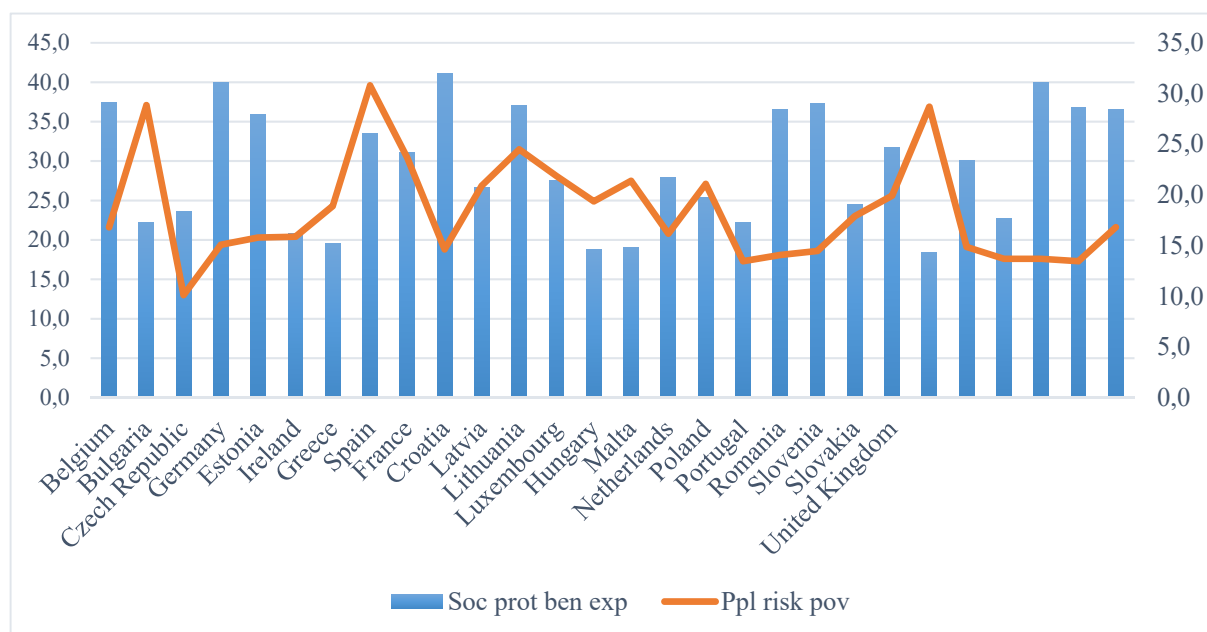


deprivation, avoiding the likelihood of falling just short or under the poverty line and be considered a poor individual.- (Stovicek and Turini, 2012).

It must be said that the social protection and social assistance programs involved in the national economy are a trade-off between the income replacing (from receiving it in an active way to a passive way) and efficiency- (Van Ours and Vodopivec, 2005). If the budgetary system is too generous in amount and duration of transferring funds and the rate of income replacement is high, that can create a permanent unemployment that's fed by the unemployment assistance- (Shavell and Weiss, 1979), but also can create negative effects on the labour market especially regarding low wage workers who might prefer getting the unemployment assistance funds and becoming benefit dependent than working for an low amount of income- (Mortensen, 1977), resulting in the appearance of the unemployment and inactivity traps- (Stovicek and Turini, 2012).

In order to have an overview of the effects of unemployment within the European Union 28 countries, the following graphs were created in order to evidently display the dynamic and the evolution of the phenomenon.

**Graph 4.** *The evolution of the rate of people at risk of poverty and the social protection benefits expenditure in the European Union 28 in 2016*

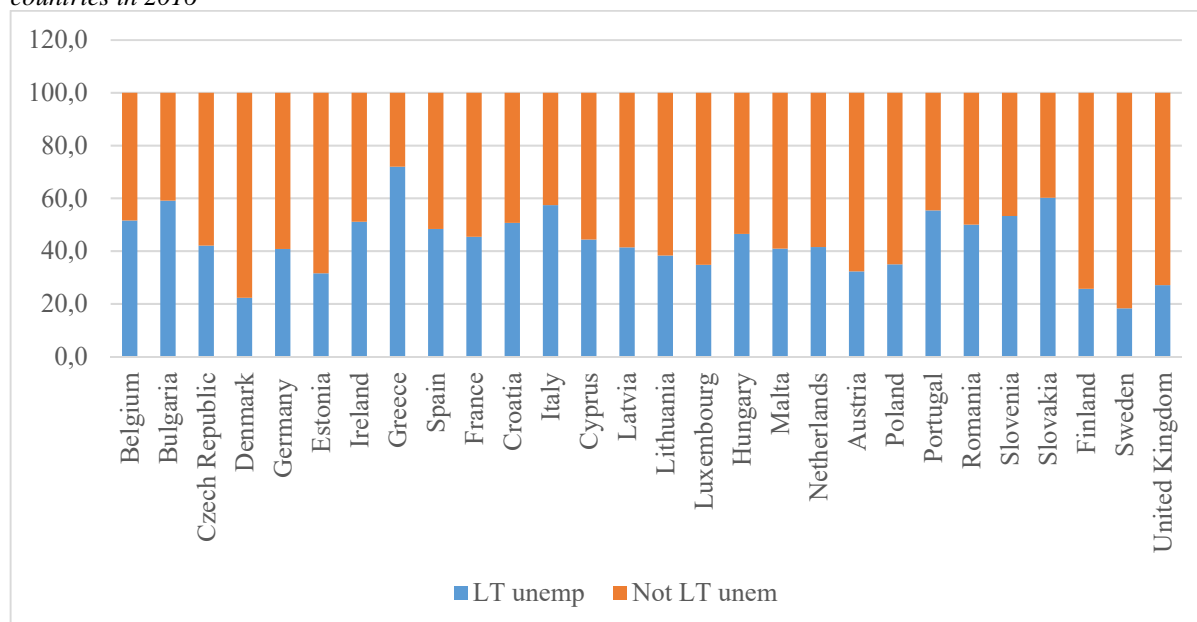


**Source:** made by the author based on Eurostat database

Based on the chart above there is a negative correlation between the amount of expenditure with social protection as percent of GDP and the poverty rate calculated as the people at risk of poverty and social exclusion as per total number of population within country. This demonstrates that the mechanism of social subsidies, as a way towards diminishing the incidence and the intensity of the poverty phenomenon, works. In countries where the percent allocated from the GDP in order to fight poverty and insure social protection is higher, the poverty rate is decreased. This can be observed in countries such as Denmark, Germany, the Netherlands, Sweden, Finland, United Kingdom or Austria that provide more than 35% of their GDP as expenditure for social protection benefits, their poverty rate being within 15-25 percent. At the opposite side, there are countries like Bulgaria, Romania or Greece that show a high poverty rate, as the funds that these countries spend as expenditure for social protection is between 15-25% as percent of GDP.

In order to have a clear overview upon how the unemployment affects people and how the social benefits affect the desire of the social protection beneficiaries to return in the labour market, the following graph was compiled. This diagram shows the percentage of long term unemployment subtracted from the total level of unemployment in EU 28 countries in 2016.

**Graph 5.** *The percentage of long term unemployment from the total unemployment registred in the EU 28 countries in 2016*



**Source:** created by the author based on Eurostat database

The countries with more than 50% from the total unemployment as long term unemployed are Greece (the country with the highest poverty rate in EU 28 in the European Union 28), Bulgaria, Italy, and Portugal. At the opposite side, there are countries such as Denmark, Estonia, Sweden, Austria, or United Kingdom where the long term unemployment is between 18 and 25%. At a simple analysis of the graph, the countries that don't spend much on social protection benefits have the highest rates of long term unemployment. This fact can be a result of various reasons: one reason can be considered to be the inclusion in social protection expenditure of the expenses to reintroduce long term unemployed individuals to the labour market (if these expenses are insignificant the effects will be ineffective), and another reason is that the unemployment insurance needs to be higher than the unemployment assistance as per the (European Commission, 2017) paper, that states that the amount of unemployment assistance has to be lower than that of the unemployment insurance in order to help the people take initiative towards reintegration in the labour market.

Also it also must be said that paid employment is able to impact poverty only when the income gained is enough to put the households above the poverty line- (Combat Poverty Agency, 1999). In fact, governments use the minimum wage as an instrument towards protecting the citizens from working for an income that it's not able to fulfill their actual basic needs, minimizing the risk of poverty on a national level- (Sabia and Burkhauser, 2010). In fact, the households that obtain some revenues, however modest, are less dependent of the social welfare programs that people that are affected by the permanent unemployment phenomenon. Even though there are working-poor, their poverty depth, level and incidence is lower than that of the unemployed people- (Combat Poverty Agency, 1999).

(Mascella et. al, 2009) issued some increase of the minimum wage using survey data collected in 2004 in order to create a profile of the poor people and poor households. In their study they showed that 80% of the low wage people do not belong to poor households, but also that 75%

of the poor households do not have one low wage member. In a *ceteris paribus* labour market, they increased just the minimum wage and trying to see its effect on poverty reduction, unfortunately with no relevant results.

(Danziger, 2009) through his mathematical model developed upon the American's labour market that, contrary to the classic belief, the low-pay workers would benefit from the increasing amount of the low wage. In fact, they showed that the low-pay workers would better benefit of the increasing in low wage amount only if there would be a high elastic unitary labour demand, creating a scale effect which acts to reduce the employment level of the low-paid workers- (Addison et al., 1993).

In case the constant would be inelastic, individuals would either find themselves in risk of losing their jobs - thus the welfare of the low-waged workers would plummet, either the working hours would get lower leading to a lower income of said individuals. (Sabia, 2008).

(Freeman, 1995) concluded that only in a market in which there is a unitary elastic demand for labour, the low-paid workers would benefit from an increased value of the minimum wage.

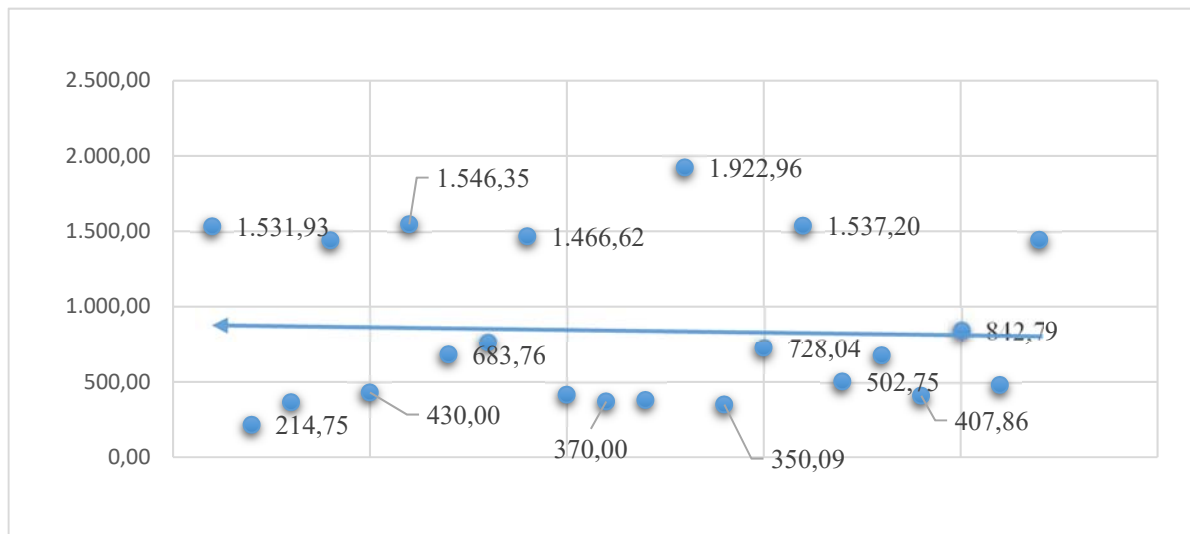
(Danzinger, 2009) continued to discover what happens with the low-paid workers that lost their employment as a result of a raised minimum wage value. It was stated that, even though the workers are risk averse, in short term their financial situation won't be that bad, as, in the majority of the American States there isn't that much of a gap between unemployment benefits and the minimum wage value. They constructed a model in which they show how the unemployment benefit would impact a homogenous elastic labour market that had the minimum wage risen.

(Sabia, 2008) and (Leigh, 2007) showed that an increase in the minimum wage would only benefit the working poor as the lessening the degree of poverty, and (Stiler, 1946) showed that in low-paying companies and businesses some of the low waged employees would benefit, but others are exposed to unemployment risks because of the increased competition between the workers based on their skills.

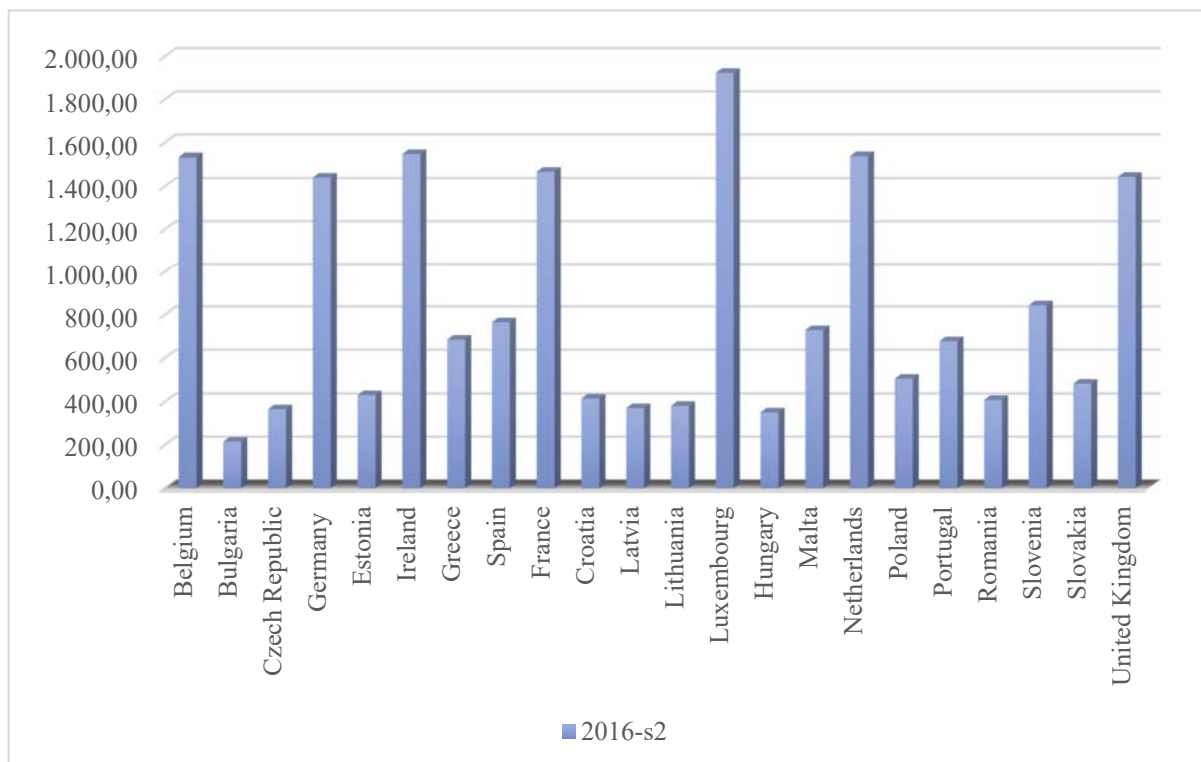
(Addison et al., 2008) studied the trends of the low-skilled workers employment by using a panel model based on the cross-country patterns that showed adverse employment trends are entered into equation if and when there are governmental interventions concerning the elevation of the minimum wage value.

(Addison et al., 1999) showed in their panel model based on American labour market that the increase of the minimum wage has uncertain effects across countries because there are many households in which the individuals do not work at all, thus the minimum wage, used as a financial instrument against poverty, has no effect.

In order to have some details regarding the evolution and the dynamics of minimum wage values in EU 28 in 2016, some graphs were needed creating.

**Graph 6.** *The level of the minimum wage value per month, expressed in EUR, in EU 22 <sup>(3)</sup> in 2016*

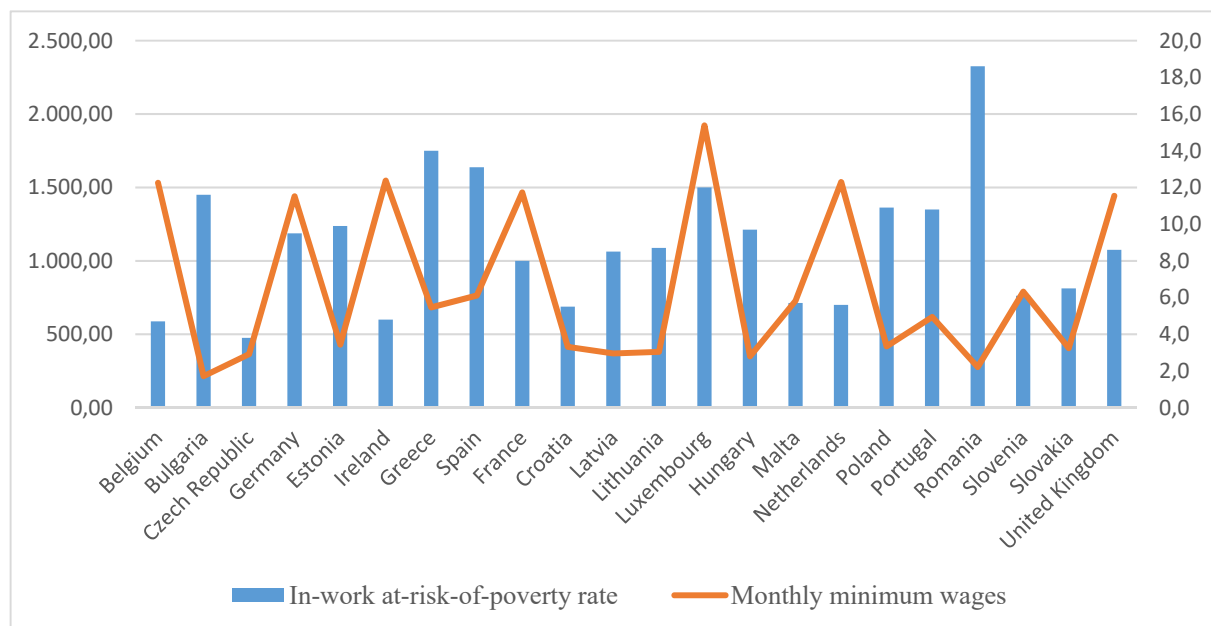
**Source:** made by the author based on Eurostat database

**Graph 7.** *The desperation of the minimum wage value per month, expressed in EUR, in EU 22 <sup>(4)</sup> in 2016*

**Source:** made by the author based on Eurostat database

Based on the previous graphic, it is clearly visible that the minimum wage value per month in 2016 is very dispersed in EU 28. The minimum is found in emerging countries such as Bulgaria, where the minimum wage per month is at about 214.75 USD, followed by Latvia with 370 USD and Romania with 407 USD. In opposition, the developed economies of Luxembourg, Netherlands and Belgium offer the employees a minimum wage that has a quantum of more than 1500 EUR per month. Based on all the above data, the average minimum wage at EU 28 level is about 840 USD.

**Graph 8.** *The correlation between the indicator in work at risk of poverty people and the minimum wage quantum in EU 22 <sup>(5)</sup> in 2016*



**Source:** made by the author based on Eurostat database

Based on the diagram above, there is a correlation between the monthly minimum wage amount and the people who work that are at risk of poverty rate. Based on the graphical analysis, it is displayed that there is a negative correlation between the two indicators previously presented. In the countries where the working individuals at risk of poverty rate is higher, the minimum wage is lower - countries as Romania that sports the highest in work of poverty risk rate (18.6%), Bulgaria, Spain or Hungary. In contradiction, there are countries where the minimum wage quantum is higher and there is a negative correlation with the rate of people who work, but are still poor - countries as United Kingdom, France, Belgium, etc. There are also countries such as Czech Republic where both working individuals in risk of poverty rate and the quantum of the monthly minimum wage are low, or countries such as Luxembourg, where even though there is the highest minimum wage salary within the studied countries, there is also a very high rate of labouring people that find themselves in risk of poverty.

**Empirical study regarding the correlations that might exist between indicators that measure poverty as the dependent variable and unemployment indicators or those regarding minimum wage value**

#### Justifying why the variables had been chosen and the purpose of the study

While in the first part of the paper, some theoretical standpoints were presented concerning the relationship between the governmental instruments that help decrease the level of social exclusion after being unemployed and the minimum wage protection while being employed, the second part will exhibit an empirical study having as main theme the relationships between these socio-economic indicators that emphasize both concepts - the social approach - the phenomenon of poverty and the economical notions - the unemployment benefits and the minimum wage legislation.

It must be specified from the very beginning that it was decided to use a panel data model to show the effects the independent variables (the indicators concerning unemployment and minimum wage) have on the dependent ones (the indicators for the poverty level or poverty

rates). The panel data model was chosen as this type of model involves the usage of the dynamic effects, and it's much more effortless to adjust complex data series while observing the behavior of the subjects analyzed during the selected time frame by especially measuring the effects of the data sets that change over time and not across subjects.

The panel data model was chosen as to see the total aggregate effect of the financial instruments used by the governments (such as unemployment benefits and minimum wage) on the real-life poverty.

The case study was built around 28 countries from the European Union, in 10 year timeframe, from 2006 to 2015. It must be specified that, based on the degree of development of the countries in the EU, the panel data model will be the best approach to be used in this case, as it involves a pooling method, which will not take into consideration the individuality of the data, so the heterogeneity of the subject data will be eliminated- (Williams, 2017).

The chosen countries for this study to mirror the impact of some governmental instruments used in order to fight poverty are: Austria, Belgium, Bulgaria, Cyprus, Croatia, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, United Kingdom, Czech Republic, Romania, Slovakia, Slovenia, Spain, Sweden, Netherlands and Hungary.

The present study was built based on similar models, previously analyzed, with similar subjects as this paper, in order to have a theoretical framework for the indicators that shall be used, but also the results that might exist.

One of the most relevant studies that were used was (Cornia, 2009), study that showed how the trade policy reform affected the income distribution and the level of poverty in Indonesia. The author used the types of households and the share of population from the totality of citizens in order to show how the income is distributed along them. As a way to measure poverty, they used an Foster-Greer-Thorbecke (F-G-T) in order to see the incidence, the depth and the poverty rate for each and every case that was studied (the pre-simulation before the trade policy reform occurred and afterwards in order to measure its effects).

Another important study that forged the basis for the present thesis is (Danziger, 2009) who used a low wage labour market in order to see how the unemployment benefits and the minimum wage could affect the labour market. By using some utility rate and the worker's productivity formulas, they managed to show how the minimum wage or unemployment benefits affect the labour market.

This paper was issued in order to measure the output that the financial instruments against poverty, if they are well developed and updated, if they have any effect, or what is the module of that output. The discourse shows some aspects from the quotidian reality of the European Union 28.

### The source for the data

Although poverty is a worldwide problem, the instruments used by governments in order to fight it are different. The European Union 28 countries were chosen as subjects for this paper because this diverse group shows which are the socio economic effects of poverty in both developed and emerging countries, while also displaying whichever are the instruments that the governments use to fight against poverty and the effects towards alleviating the phenomenon. The series of data were chosen to encompass a ten years time frame (from 2006 to 2015) inside which the European economies had both ascendent and descendent trends, mainly due to financial crisis, resulting in a mathematic representation of how governments deal with this social issue with the help of financial instruments.

The data used was compiled from downloaded Eurostat databases as the main source of data, provided and used by the European Committee, European Commission and all the other European institutes in order to have access to accurate multidimensional data and indicators that were registered and calculated in the European Union.

All the data used in this study case were exposed as ratios in order to ensure a correct and unitary comparison across the data series initially analyzed, so that all the results based on the correlations between them would be relevant and accurate.

#### Description of the variables, the equations and the model that has been used in the present case study

The starting point of this paper was the question: How do unemployment and unemployment benefits affect poverty? What is the correlation between the minimum wage value and the dimensions of poverty?

The original element of this case study would be the analysis of the main interventions of the government in the labour market in order to see their impact - as independent variable - on the poverty phenomenon - as dependent variable.

The present study is built around three main equations based on multiple panel data series. The equations were created, compiled and analyzed by using Eviews 7, each having three independent variables and one dependent variable. The form of these equations is presented below:

The first equation:  $A_1 = \alpha_1 + \beta_{11} * B_{t11} + \beta_{12} * B_{t12} + \beta_{13} * B_{t13}$

The second equation:  $A_2 = \alpha_2 + \beta_{21} * B_{t21} + \beta_{22} * B_{t22} + \beta_{23} * B_{t23}$

The third equation:  $A_3 = \alpha_3 + \beta_{31} * B_{t31} + \beta_{32} * B_{t32} + \beta_{33} * B_{t33}$

The dependent variables that were chosen represent the indicators that show the mathematical reality created by poverty upon society, such as: the percentage of people that are in risk of poverty or social exclusion as part from the total population, the percentage of the persistence in poor individuals as per total amount of poor people, the percentage of people in risk of poverty and social exclusion that graduated just the lower secondary education level and the rate of the working poor as part from the total population within a country.

As independent variables indicators that might affect the poverty level, the unemployment rate and the benefits offered by the government in case this phenomenon happens, and the minimum wage were used. It must be said from the very beginning that there was no correlation that could be found within the EU28 countries between the working poor and the minimum wage quantum. The independent variables were: the total rate of unemployment, the total amount of expenditure for social protection as percentage of GDP, the total amount of expenditure for social exclusion as percentage of GDP, the percentage of the minimum wage divided by the monthly earnings, the benefit of full unemployment as percentage of GDP, the rate of unemployed people that just graduated the lower secondary education level as percentage of total population, the rate of at risk of poverty people after the social transfer benefits were done and the rate of the long term unemployment as percentage of the unemployed persons.

The first equation exhibits the rate of people that are in risk of poverty or social exclusion as percentage from the total population as the dependent variable, while the independent variables are: the total rate of unemployment (total number of unemployed persons divided by the total population), the percentage of GDP allocated for social protection expenditure and the percentage of GDP allocated for social exclusion expenditure.

The second equation has as the dependent variable the rate of persistency within the poor individuals, indicator which is calculated as the total amount of persons that are persistent in poverty divided by the total amount of poor people, whilst the independent variables are: the placement services and job search assistance expenses divided by the total amount of GDP, the social protection expenditure as percentage of GDP and the level of long term unemployed persons divided by the total amount of unemployed persons.

The third equation is based on the total persons that are at risk of poverty and social exclusion that graduated just the lower secondary educational grade, with the independent variables: the percentage of the monthly minimum wage divided by average monthly earnings, the full unemployment benefits expenditure as percentage of GDP and the total rate of unemployed persons that just graduated lower secondary educational level divided by the total amount of population.

The proposed equations for this study are as follows:

*Hypothesis 1:* there should be a positive correlation between the total rate of unemployment and the total rate of people in risk of poverty and social exclusion as percentage of the total population. (Saunders, 2002) and (Tregenna and Tsela, 2008), (Martinez et. al, 2001) showed within their papers that as higher the unemployment rate goes, the greater the total poverty rate is (calculated as the percentage of people in risk of poverty and social exclusion as per total number of persons). Regarding the percentage of expenditures of social protection and social exclusion from the total amount of GDP, it seems that there should be a negative correlation- (Barrientos, 2010), (Handayani, 2014), (Aldrige et al., 2011), as the governments spend those funds exactly for the decreasing the level of poverty within their states.

*Hypothesis 2:* an indirect interaction should exist between the expenditure that the government spend with the placement services and job search assistance and the level of persons that are persistent in poverty divided by the total number of poor persons. The persistence in poverty means that a person is poor for a long period of time and it cannot/ does not want to get out from the “poor” status-quo. The placement services and job search assistance funds are directly designated towards individuals that are no longer eligible to receive unemployment insurance funds and need to look for another job. So, in this case, there should be a direct and strong correlation between the persistent in poverty persons as percentage of total poor people with the long term unemployment benefits. Regarding the relationship between the dependent variable and the expenditure of social protection expressed as percentage of GDP, one can affirm that there should be a negative correlation between the social protection expenditure as percentage of GDP indicator and the amount of persons that are persistent in poverty as percentage from the total amount of poor persons. Apart of the unemployment benefits that are considered social protection expenditure, under this cluster of governmental expenditure, there are also expenditures allocated towards trying to help these people escape poverty. In case the above expenses increase, the level of people persistent in poverty should decrease. Regarding the correlation between the percentage of persistent in poverty persons as percentage of the total number of poor people and the percentage of long term unemployment as percentage of the total unemployment, there needs to be a direct correlation as the persistent in poor persons are usually the ones that have not been hired for a long period of time.

*Hypothesis 3:* there should be a negative interconnection between the percentage of the monthly minimum wage divided by the average amount of monthly earnings and the total persons in risk of poverty and social exclusion that have just graduated the lower secondary educational level. (Sabia and Burkhauser, 2010) and (Danziger, 2009) determined that an increase in minimum wage amount would affect mainly the low wage workers. Usually, the low wage workers are the ones that don't have a specialization in the labour market, expertise



that could have been provided through the educational attendance. In regard of the correlation between the dependent variable, the percentage of people in risk of poverty and social exclusion with the secondary educational level as per total population and the expenditure with full unemployment benefits as percentage of GDP, a negative correlation should exist. The benefits obtained because of the unemployed status can save people from poverty in case the unemployment benefit would be their only monthly earning. (Martinez et al., 2001) showed that a lot of people could have lessened their poverty depth or their households could be placed above the poverty line if unemployment benefits were to be received. Regarding the correlation between the poverty rate of the people that just graduated the lower secondary level of education and the total population and the unemployment rate of the people that have just graduated the same level of education, there shall be a positive correlation - as the unemployment in this specific group starts rising, there amount of poor people from that particular group should increase.

### The analysis of the regressions

#### *The first hypothesis*

The first regression proposes the rate of people in risk of poverty or social exclusion as percentage of the total population as dependent variable, while the independent variables are: the total rate of unemployment (total number of unemployed persons divided by the total population), the percentage of GDP allocated for social protection expenditure and the percentage of GDP allocated for social exclusion expenditure.

**Table 1.** *The results of the first hypothesis*

Indicator	Coefficient
Total_unemploment	0.696390***
Social_excl_exp_GDP	-0.646762***
Social_prot_exp_GDP	-2.476799***
C	3.030512***
R <sup>2</sup>	0.78
Observations	275
F-stat (p-value)	92.484 (0.00)

\*p≤0.1; \*\*p≤0.05; \*\*\*p≤0.001

**Source:** obtained by the author based on the Panel Data Model compiled in Eviews outputs

Analyzing the Table 1 that shows the results obtained by compiling the first regression in Eviews, one can deduct that the variables of regression are valid as their associated probability is less than 1%. The table with the output certifies the first hypothesis, so the correlation between the dependent and the first independent variable is negative, while with the second it is positive. Concerning the first correlation, the results state that at a percentile growth of the total unemployment rate, the total poverty rate (expressed as the total persons in risk of poverty or social exclusion as percentage of the total population) would get higher with 0.69 percent. Regarding the second and the third interrelationship, it is visible that the independent variables indirectly affect the dependent variable, so, in this case, that would mean that at a 1 percent increase of the total expenditure with social exclusion, the poverty level would decrease with 0.64%, but if the total expenditure with social protection would rise with 1%, that would cause a massive effect on poverty decreasing it with 2.47%. Unfortunately, the simple raise of the social protection expenditure won't be enough to clear poverty as it would not stimulate the initiative of unemployed persons to reintegrate in the labour market and it can create an inefficient allocation of public funds.

As the value of the R<sup>2</sup>, is 78%, the study can be considered as valid, as it is considerably close to 100%. Based on this value of 78%, one could reason that the variation of the dependent variable can be explained by differences that might occur at the end of the independent variables.

The Fisher test is valid based on the 0% probability of the p-value associated with it, the null hypothesis won't be accepted, resulting in an impossibility of the input to not affect the output.

**Table 2.** *Pearson's correlation matrix output for the first hypothesis*

Correlation	Ppl_risk_of_pov	Unempl_tot	Soc_excl_ben_GDP	Soc_prot_ben_GDP
Ppl_risk_of_pov	1.00			
Unempl_tot	0.44+	1.00		
Soc_excl_ben_GDP	-0.22+	0.24***	1.00	
Soc_prot_ben_GDP	-0.39+	0.31***	0.16*	1.00

**Source:** obtained by the author based on the Panel Data Model compiled in Eviews outputs

Based on the values in expressed in Table 2, the correlations between the variable are not that tight, the most considerable is between the total amount of people in risk of poverty and social exclusion divided by the total number of the population and the total unemployment rate fat about 0.44 units. It cannot be considered a high correlation as high correlations have a coefficient higher than 0.7 units. It is visible from the table above that the correlation signs remain the same as in the initial hypothesis, so the variables share the same direction in case they have a positive correlation (such as between the total rate of poverty and total rate of unemployment, the total unemployment rate and the expenditures for social exclusion and social protection divided by the GDP or between the expenditure with social exclusion and social protection, both of them divided by GDP) or a different direction in case the correlation between them is negative (such in the case of the total poverty rate and the expenses with social exclusion and protection as percentage of GDP). Apart of the correlations that were expected and were previously analyzed, in this table, there are three more correlations that were not explained until now. The first and second correlations would be between the total unemployment rate and the percentage of GDP allocated for expenses with social exclusion and social protection. This correlation is positive in both cases as, when the unemployment rate grows, the governmental expenditure with social exclusion and protection shall increase in order to satisfy the demand of population for social transfers.

**Table 3.** *The descriptive statistics regarding the first hypothesis*

Indicator\ Value	Mean	Median	No. of observations
Ppl_risk_of_pov	24.34	21.4	274
Unempl_tot	9.129	7.8	274
Soc_excl_ben_GDP	0.66	0.5	274
Soc_prot_ben_GDP	1.2	1	274

**Source:** obtained by the author based on the Panel Data Model compiled in Eviews outputs

Based on the Table 3 describing the descriptive statistics of the first regression, it can be said that all the number of observations is equal in all cases, that translate to the fact that no data was missing when the regression was compiled. The mean value of the first indicator is higher than the medium, so the data set sways to the left. Thus, the dispersion between the data of the variable is high, resulting that the gap between the maximum and the minimum value is significant. Based on the fact that the data series is bent to the left, one could deduce that there are some countries where the poverty rate is really low and that's the reason the medium value is so low, but the majority of the countries have a poverty rate higher than 24.34%. Regarding the second value, the total rate of unemployment, the series is sways, again, to the left, fact that is also happening with the other two variables: the social exclusion benefits expenditure as percentage of GDP and the social protection benefits expenditure as percentage of GDP. The interesting fact about the last three variables, which are actually the independent is that the gap between the mean and medium value is not that substantial, so the data series isn't as divergen as the first.

### *The second hypothesis*

The second regression has the rate of persistent in poverty persons as the dependent variable, indicator that is calculated at the total amount of persons that are persistent in poverty divided

by the total amount of poor persons, while the independent variables are: the placement services and job search assistance expenditure divided by the total amount of GDP, the social protection expenditure as percentage of GDP and the level of long term unemployed persons divided by the total amount of unemployed persons.

**Table 4.** *The results of the second hypothesis*

Indicator	Coefficient
Job_search_exp_GDP	-0.292267***
Soc_prot_exp_GDP	-0.212758***
LT_unempl_Tumpl	0.0710337***
C	2.627924***
R <sup>2</sup>	0.65
Observations	218
F-stat (p-value)	89.09686 (0.00)

\*p≤0.1; \*\*p≤0.05; \*\*\*p≤0.001

**Source:** obtained by the author based on the Panel Data Model compiled in Eviews outputs

Based on the previous table, it is visible that the test is valid as the value associated with the Fisher test is 0, also, the value of R<sup>2</sup>, is high enough for a panel data model, thus, the total variation of the dependent variables can be explained based on the variation of the independent variables that amountsto 65.12%.

Regarding the coefficients, their signs respect the initial hypothesis regarding this equation, resulting in a valid hypothesis. At a 1% growth of the percentage of GDP for the expenses allocated for placement services and job search assistance, the persistence of poverty would decrease with 0.29%. Regarding the correlation between the long term unemployment and the persistence in poverty there is a positive relationship. Hence, if the long term unemployment raises with 1 percentage point, the persistent people in poverty people level would raise with 0.07%. The social protection expenditure as percent of GDP and the percentage of people that are persistent in poverty divided by the number of total poor people correlation results in the fact that at a 1% rise of the social protection expenditure as percent of GDP, the persistence of poverty would decrease with 0.21%.

**Table 5.** *Pearson's correlation matrix output for the second hypothesis*

Correlation	Persist_inpov_Tpoor	Job_search_exp_GDP	Soc_prot_ben_GDP	LT_unempl_Tumpl
Persist_inpov_Tpoor	1.00			
Job_search_exp_GDP	-0.36***	1.00		
Soc_prot_exp_GDP	-0.06+	0.28+	1.00	
LT_unempl_Tumpl	0.35***	0.12**	0.20***	1.00

**Source:** obtained by the author based on the Panel Data Model compiled in Eviews outputs

Based on the results displayed in the previous table, the correlations between the variables are not that strong, having a maximum value of 0.36 units. The positive/negative values match the initial hypothesis, confirming it. Concerning the other correlations that were not yet stated, it can be said that there is a direct correlation of about 0.28 between the job search assistance expenditure as percent of GDP and the social protection expenditure as percent of GDP. This weak interaction can be explained on the fact that there might be other components apart of the job search assistance expenditure in the social protection benefits whose trend was not constant or homogenous, resultingwith this poor correlation. Regarding the social protection benefits expenditure as percent of GDP and the long term unemployment as percent of total unemployment, a direct correlation was expected as the benefits increase when the unemployment rises.

**Table 6.** *The descriptive statistics regarding the second hypothesis*

Indicator\ Value	Mean	Median	No. of observations
Persist_inpov_Tpoor	8.44	8.1	274
Job_search_assistanceexpenditure_GDP	0.35	0.31	274
Soc_prot_exp_GDP	1.23	1.1	274
LT_unempl_Tumpl	41.64	44.0	274

**Source:** obtained by the author based on the Panel Data Model compiled in Eviews outputs

Based on the values portrayed in the previous table, all the data series, aside the last, are skewed to the right as the median value it's higher than the mean, while the last data series presented in this table is swaysbecause of the higher median than mean value.

As the mean and median values don't have large gaps, it can be said that the data that variables contain are not too dissimilar. A notable fact that can be observed from reading the values of Table 6 is that almost half of the unemployed individuals are, in fact long term unemployed.

### *The third hypothesis*

The third regression is based on the dependent variable - the rate of persistent people in poverty - indicator that is calculated as the total amount of poor individuals that persist in poverty divided by the total amount of poor people, while the independent variables are: the long term unemployment benefits divided by the total amount of GDP, the social protection expenditure as percentage of GDP and the level of long term unemployed persons from the total amount of unemployed persons.

**Table 7.** *The results of the third hypothesis*

Indicator	Coefficient
Min_wage_avg_month_earn	-0.473684*
Full_unempl_ben_GDP	-3.986370***
Unempl_seclow	0.429147***
C	3.030512***
R <sup>2</sup>	0.58
Observations	274
F-stat (p-value)	69.75104 (0.00)

\*p≤0.1; \*\*p≤0.05; \*\*\*p≤0.001

**Source:** obtained by the author based on the Panel Data Model compiled in Eviews outputs

The test is validated through the 0 probability associated with the F-stat. Although the value of the coefficient of the F-stat is not that close to 100, the results support the hypothesis at a sufficient level, although not in a absolute manner.

Regarding the value of R<sup>2</sup>, it is lower as a result of the usage of the first independent variable min\_wage\_avg\_month\_earn, becauseof its very dynamic value across the data series. Even though the value of this statistic test is not that close to 100%, based on the fact that in this paper a panel data model was used, a 58% is a good value as the variation of the independent variables explains the variation of the dependents.

At a close analysis of the coefficients associated with the independent variables, it is visible that these coefficients respect the previously mentioned hypothesis, leadingto a negative correlation between the number of people in risk of poverty and social exclusion who graduated just the lower secondary education level divided by the total amount of poor persons and the percentage of the monthly minimum wage as ratio of the monthly income of an individual (considering the amounts from the end of each year of the two indicators) and also with the percentage of the GDP allocated to support the full unemployment benefits. In the case of the first correlation, a rise with 0.47% of the monthly minimum wage in the monthly average income results in a 1% decrease of the percentage of people who are at risk of poverty and graduated just the lower secondary educational level. In other words, if the monthly minimum wage would get higher, while the average monthly earnings would remain the same, the number of low wage workers (the ones that have poor or no qualifications) would decline. While thinking about the correlation between the benefits offeredto individuals that are in unemployment risk (both considering the insurance and the assistance unemployment funds) and the percentage of poor people that graduated just the lower secondary educational level, an increase of the independent variable with 1 unit would cause an almost 4% decline of the dependent variable.

Concerning the last correlation of this regression, it was expected that a positive and tight correlation between the unemployment and the poverty affecting people of the same group-people that graduated just the lower secondary educational level would exist, thus an increase of 1 percentage of the unemployment of the people in this group will cause a rise of the people in poverty risk belonging to this group at about 0.42%.

**Table 8.** *Pearson's correlation matrix output for the first hypothesis*

Correlation	Ppl_risk_of_pov_SecLow	Min_Wage_avg_month_earn	Full_unempl_ben_GDP	Unempl_sec_low
Ppl_risk_of_pov_secLow	1.00			
Min_wage_avg_month_earn	-0.322***	1.00		
Full_unempl_ben_GDP	-0.3352***	0.1035+	1.00	
Unempl_secLow	0.369	-0.3527***	0.0849***	1.00

**Source:** obtained by the author based on the Panel Data Model compiled in Eviews outputs

Based on the previous table, it is clearly visible that the correlations assumed in the initial hypothesis are confirmed. Within Table 8 there are just low interrelationships between the variables analyzed, as the maximum value is 0.369. Regarding the other three correlations that appear and were not analyzed before, all of them are very insignificant. The correlation between the percentage of the monthly minimum wage and the monthly average earnings and the benefits offered to the unemployed expressed as percentage of GDP is positive. Based on this result, the policies for helping the employees in the UE28 are well established and developed. Regarding the percentage of persons that are not employed and have just graduated the lower secondary educational level and the percentage of the minimum wage related to the average monthly revenues, there is a negative correlation at play. Seems that a rise of the minimum wage makes low wage workers that have just graduated lower secondary educational level want to reintegrate in the labour market. The third relationship - the unemployment and the full unemployment benefits - is based on the same direction of evolution of both data sets, having, however, an insignificant correlation. This has as probable cause the fact that the majority of the full unemployment benefits are not directed towards the lower secondary educational attainment unemployed individuals.

**Table 9.** *The descriptive statistics regarding the third hypothesis*

Indicator\ Value	Mean	Median	No. of observations
Ppl_risk_of_pov_secLow	42.85	40.8	157
Min_wage_avg_month_earn	41.22	41.5	157
Full_unempl_ben_GDP	0.67	0.4	157
Unempl_secLow	18.6	16.3	157

**Source:** obtained by the author based on the Panel Data Model compiled in Eviews outputs

Based on the table above, the values show that the first two data series are leaning to the right as their median value is higher than the mean, as opposite to the last two data series presented, that are swayed to the left, because of higher mean value. The disparity between the mean and the median figures is relatively small, thus the data sets are similar. Some interesting statistics can be observed at an overview of the table: almost half of the poor people have graduated just the lower secondary educational level, as well as the fact that the monthly minimum wage represents approximatively 40% of the monthly average income. Although the majority of the poor people that graduated just the lower secondary educational level divided by the total amount of poor people is almost 50%, the unemployment of these people is not that high at around 18.6%. This result can be explained by the fact that low wage workers are much more demanded on the labour market than workers with higher qualification.

## Conclusions

This paper analyzes the effects of governmental interventions on the labour market that directly affects poverty, trying to emphasize the correlations between these socio- economic

independent variables (such as minimum wage and unemployment benefits indicators) on the social dimension of poverty. The study was issued on the EU 28 countries in the period 2006-2015. As the empirical studies were valid, the probabilities associated to the coefficients values were less than those of the significant level and the value of  $R^2$  were relevant, the final results are sufficient and one can assume that both unemployment benefits and minimum wage have effects as financial instruments used by the authorities in order to alleviate poverty.

In the first part of this study theoretical correlations and influences between the previously mentioned independent and dependent variables were presented, based on the reviewed published literature. The second part is focused on an empirical analysis of the correlations presented in the first part in order to see their practical capability and applicability on the EU 28 countries within a specified time frame (2006- 2015).

Based on the empirical study, the unemployment benefits and the minimum wage can be used as financial instruments for alleviating poverty in EU 28 countries.

### Further research

By taking into consideration both the phenomenon of poverty and governmental intervention within the labour market there are a lot of directions in which this paper can be improved or the outputs extended.

An analysis on how could a natural logarithm of minimum wage affect the poverty rate would be beneficial to the paper's subject. Thus arising a need to of other data sets with different statistics than those already analyzed in the present paper.

Another study direction could be followed by dividing the unemployment phenomenon variables by gender, age, degree of urbanization and many other social dimensions in order to see if there gaps and discrepancies between different clusters and how much effect they have upon the persistence, incidence and intensity of poverty.

---

### Notes

<sup>(1)</sup> (World Bank, 2004: pp. 226)

<sup>(2)</sup> (World Bank, 2009: pp. XVII)

<sup>(3)</sup> There were no data available for Denmark, Italy, Cyprus, Austria, Finland and Sweden regarding the level of the monthly minimum wage.

<sup>(4)</sup> There were no data available for Denmark, Italy, Cyprus, Austria, Finland and Sweden regarding the level of the monthly minimum wage.

<sup>(5)</sup> There were no data available for Denmark, Italy, Cyprus, Austria, Finland and Sweden regarding the level of the monthly minimum wage.

---

### References

- Addison, J.T. and McKinley, L. Blackburn, 1993. *The Effect of Recent Increases in the U.S. Minimum Wage on the Distribution of Income*, Washington, D.C.: Employment Policies Institute.
- Addison, J.T. and Blackburn, McKinley, L., 1999. Minimum Wages and Poverty, *ILR Review*, Vol. 52, No. 3 (Apr., 1999), pp. 393-409.
- Addison, J.T., Blackburn, McKinley, L. and Cotti, C.D., 2014. On the Robustness of Minimum Wage Effects: Geographically-Disparate Trends and Job Growth Equations, *Discussion Paper Series*, IZA DP No. 842, found at: <<http://ftp.iza.org/dp8420.pdf>>

- Aldrige, H., Anushree, P., MacInnes, T. and Kenway, P., 2011. Monitoring poverty and social exclusion in 2011, Joseph Rowntree foundation, ISBN: 9781859358887 (paperback), found at: <<https://www.jrf.org.uk/sites/default/files/jrf/migrated/files/poverty-social-exclusion-assessment-full.pdf>>
- Barrientos, A., 2010. Poverty Reduction and Policy Regimes. Thematic Paper, United Nations Research Institute for Social Development, Social Policy and Development, Programme Paper Number 42 January 2010
- Bond, L., 1994. Access to Public Libraries for Marginalised Groups, *Combat Poverty Agency*, 1871643929, Combat Poverty Agency, 1999. Unemployment and Poverty, Poverty Briefing No. 7 Unemployment and Poverty, found at: <[http://www.combatpoverty.ie/publications/povertybriefings/Briefing7\\_Unemployment &Poverty\\_1999.pdf](http://www.combatpoverty.ie/publications/povertybriefings/Briefing7_Unemployment&Poverty_1999.pdf)>
- Cornia, A.G., 2005. Policy Reform and Income Distribution, *DESA Working Paper* No. 3, ST/ESA/2005/DWP/3
- Cousins, M., 2007. Welfare Policy and Poverty. Dublin: Combat Poverty Agency, found at: <[http://www.combatpoverty.ie/publications/WelfarePolicyAndPoverty\\_2007.pdf](http://www.combatpoverty.ie/publications/WelfarePolicyAndPoverty_2007.pdf)>
- Craig, S. and McKeown, K., 1993. A Partnership Approach to Long-Term Unemployment: a summary of the Interim Evaluation of the Area-Based Initiative on Long-Term Unemployment established under the Programme for Economic and Social Progress, *Combat Poverty Agency*, 1871643716, 1993
- Danziger, L., 2009. The Elasticity of Labor Demand and the Minimum Wage, *Journal of Population Economics*, Vol. 22, No. 3 (Jul., 2009), pp. 757-772.
- European Commission, 2017. European Semester Thematic Factsheet, “Unemployment benefits”, found at: <[https://ec.europa.eu/info/sites/info/files/file\\_import/european-semester\\_thematic-factsheet\\_unemployment-benefits\\_en.pdf](https://ec.europa.eu/info/sites/info/files/file_import/european-semester_thematic-factsheet_unemployment-benefits_en.pdf)>
- Eurostat, <<http://ec.europa.eu/eurostat/data/database>>
- Freeman, R.B., Comment. In: Ehrenberg RG (ed), 1995. Review symposium on myth and measurement: the new economics of the minimum wage, *Ind Labor Relat Rev*, 48, p. 830.
- Handayan, S.W., 2014. Poverty dimensions. The social protection index: Assessing Results for Asia and the Pacific, *Asian Development Bank*, No. 22 May 2014, found at: <<https://www.adb.org/sites/default/files/publication/42479/poverty-dimension-social-protection-index.pdf>>
- Leigh, A., 2007. Does Raising the Minimum Wage Help the Poor?, *The Economic Record*, Vol. 83, Issue 26, December 2007, pp. 432-445.
- Martinez, R., Ayala, L. and Ruiz-Huerta, J., 2001. The impact of unemployment on inequality and poverty in OECD countries, *The European Bank for Reconstruction and Development*, Vol. 9, Issue 2, pp. 259-558.
- Mascella, A., 2009. Minimum Wage Increases as an Anti-Poverty Policy in Ontario, *Canadian Public Policy*, Vol. 35, No. 3, pp. 373-379 | 10.1353/cpp.0.0030
- Mortesten, D.T., 1970. A Theory of Wage and Employment Dynamics, *Microeconomic Foundations of Employment and Inflation Theory*. E. S. Phelps et al., eds. New York: W. W. Norton, pp. 124-66.
- Polak, P. and Warwick, M., 2013. The Business Solution To Poverty Designing Products And Services For Three Billion New Customers, found at: <<http://oxf-edu.ca/srv-1/the-business-solution-to-poverty-designing-products-and-services-for-three-billion-new-customers-by-polak-paul-warwick-mal-2013-hardcover>>
- Rowntree, B.S., 1908. Poverty. A study of a town life, found at: <<https://archive.org/details/povertyastudyto00rowngoog>>
- Sabia, J.J., 2008. Minimum wages and the economic wellbeing of single mothers, *Journal of Policy Analysis and Management*, 27, pp. 848-66.
- Sabia, J.J. and Burkhauser, R., 2010. Minimum Wages and Poverty: Will a \$9.50 Federal Minimum Wage Really Help the Working Poor?, *Southern Economic Journal*, Vol. 76, Issue 3, pp. 592-623.
- Saunders, P., 2002. Social Research Policy Center, The direct and indirect effects of unemployment on poverty and inequality, *SRCP Discussion Paper*, No. 118.
- Sen, A.K., 1974. Informational Bases of Alternative Welfare Approaches: Aggregation and Income Distribution, *Journal of Public Economics*, 4 (1974), pp. 387-403.
- Shavell, S. and Weiss, L., 1979. The Optimal Payment of Unemployment Insurance Benefits over Time, *The Journal of Political Economy*, Vol. 87, No. 6. (Dec., 1979), pp. 1347-1362.
- Stigler, G.J., 1946. The Economics of Minimum Wage Legislation, *American Economic Review* 36(3), pp. 35-365.
- Stovicek, K. and Turini, A., 2012. Benchmarking Unemployment Benefit Systems”, *Economic and Financial Affairs, European Committee, Economic Papers* 454 | May 2012, found at: <[http://ec.europa.eu/economy\\_finance/publications/economic\\_paper/2012/pdf/ecb454\\_en.pdf](http://ec.europa.eu/economy_finance/publications/economic_paper/2012/pdf/ecb454_en.pdf)>

- Tobin, J., 1969. Agenda for the Nation, "Raising the income for the poor", K. Gordon, ed. Washington, DC: Brookings Institution, pp. 77-116
- Tregenna, F. and Tesla, Mfanafuthi, 2008. Inequality and Economic Marginalisation. Inequality, unemployment and poverty in South Africa, *Trade and Industrial Policy Strategies*, found at: <[http://www.tips.org.za/files/u65/inequality\\_unemployment\\_and\\_poverty\\_-\\_tregenna\\_and\\_tsela.pdf](http://www.tips.org.za/files/u65/inequality_unemployment_and_poverty_-_tregenna_and_tsela.pdf)>
- United Nations Development Programme (UNDP), 2006. International Poverty Center, "Poverty in focus", found at: <<https://opendocs.ids.ac.uk/opendocs/ds2/stream/?#/documents/413/page/1>>
- Van Ours, J.C. and Vodopivec, M., 2005a. How Changes in Benefits Entitlement Affect the Duration of Unemployment, *Center Discussion Paper*, 2005- 30, Tilburg University, The Netherlands.
- Williams, R., 2017. Panel Data 4: Fixed Effects vs Random Effects Models, University of Notre Dame, found at: <<https://www3.nd.edu/~rwilliam/stats3/Panel04-FixedVsRandom.pdf>>
- World Bank, 2009. Handbook on Poverty and Inequality, found at: [http://siteresources.worldbank.org/INTPA/Resources/429966-1259774805724/Poverty\\_Inequality\\_Handbook\\_FrontMatter.pdf](http://siteresources.worldbank.org/INTPA/Resources/429966-1259774805724/Poverty_Inequality_Handbook_FrontMatter.pdf)
- World Bank, 2004. World Development Indicators, found at: <<http://documents.worldbank.org/curated/en/517231468762935046/pdf/289690PAPER0WDI02004.pdf>>
- World Bank, 2001. World Development Report 2000/2001. Attacking poverty, Oxford University Press, found at: <<http://documents.worldbank.org/curated/en/230351468332946759/pdf/226840WDR00PUB0ng0poverty0200002001.pdf>>



# The economic impact of indirect taxes on economic growth in European context

**Phd. student Chiricu Cosmina-Ştefania**  
Finance Doctoral School, Romania  
Bucharest University of Economic Studies  
cosmina.stefania@ymail.com

**Abstract.** *This paper highlights the economic impact upon the economic growth of the usual indirect taxes such as VAT, excises and other consumption taxes by taking in consideration a Panel data model. The empirical research is founded upon a database from 2002 – 2016 which includes information about the EU – 28 state members and is in accordance with other similar studies from the specialty literature. The empirical analysis is oriented towards determining positive correlations upon the economic growth, therefore the results emphasized on a small scale a positive impact of the independent variables on the economic growth. Moreover, the conclusions are justified by the size of the GDP, the corruption index as well as the level of efficiency of the fiscal system of each country.*

**Keywords:** economic impact, indirect taxes, economic growth, fiscal revenues, excises, VAT.

**JEL Classification:** H29, H24.

## 1. Introduction

Society perceives economic growth as a proof that life quality improved as a result of several supported efforts such as consumption growth, quality of goods and services improvement, unemployment rate decrease, welfare growth and poverty reduction. On a different note, taxation is the element that provides the fiscal revenues destined to public consumption and income redistribution which supports in the meantime the economy. Indirect taxation, through its mechanisms implies an easier allocation of revenues than direct taxation. In principle, indirect taxes do tax consumption and impacts upon the economy and the population, therefore numerous qualitative and quantitative studies were initiated in order to determine the severity of such an impact.

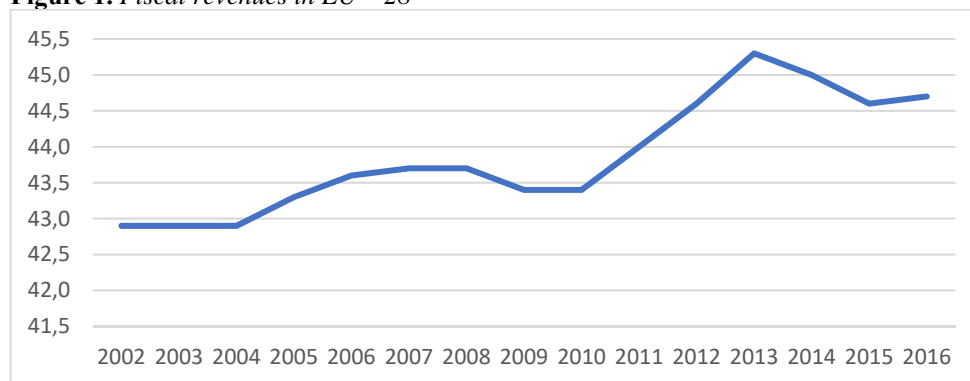
In connection with the economic growth, literature consists in a variety of studies by researchers who proposed different growth models with exogenous variables: for example, **Solow (1956)** claims that fiscal policy has no long-term effects on economic growth and other papers which include endogenous variables (as the one by **Barro, 1990**, which supports the otherwise). For the empirical analysis I considered the years before the financial crisis of 2007 as well as the difficult years of recovery right after it (it is important to mention the fact that a lot of the EU members confronted with difficulties in budget reconsolidation and fiscal reforms which would have sustained the economic growth and would have had a favorable social impact. For a lot of the EU members it was necessary to rethink the fiscal system in order to stimulate economic growth (such trend was noticeable around the Northern Europe and Eastern Europe).

The main purpose of my study implies the evaluation of the indirect taxes impact upon economic growth by using an econometric analysis with data from the EU – 28 state members and a Panel model for 2002 – 2016 years. The variables include indirect taxes, budgetary expenditure and a control variable related to economical and socio-political factors. The main conclusions of the research indicate both negative and positive effects of the independent variables on the dependent one, therefore: the VAT helps in economic growth while budgetary expenditure, excises and other consumption taxes have a negative impact upon economic growth.

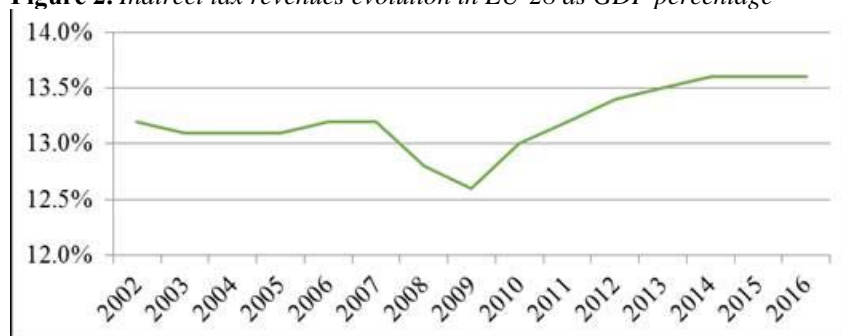
This paper is structured as follows: the first section comprises the introduction, the second section highlights a comparison between the values and the structure of the indirect taxation at European level, the third section consists of the literary review, the fourth section presents the database and the methodology used in the research, the fifth section puts forward the results and the last section presents the conclusions.

## 2. EU – 28 indirect taxes structure and evolution:

As shown in Figure 1, between 2002 and 2016, the taxes revenues (as GDP percentage) trend in EU – 28 recorded a slight growth between 2004 and 2008, followed by a rapid decrease in 2009 as a result of the financial crisis and a period of stagnation between 2009 and 2010. Moreover, starting with 2010, at EU level, the fiscal revenues recorded a rapid growth, reaching the maximum value in 2013: 45,3% in GDP.

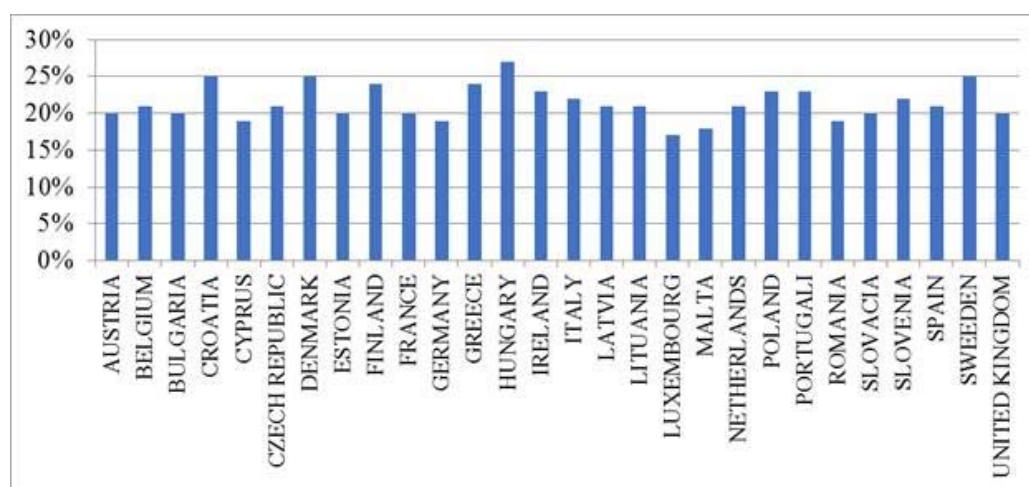
**Figure 1.** Fiscal revenues in EU – 28

**Source:** Author's processing based on Eurostat data.

**Figure 2.** Indirect tax revenues evolution in EU-28 as GDP percentage

**Source:** Author's processing based on *ec.europa.eu* data.

Figure 2 highlights the indirect tax revenues evolution in EU – 28 as GDP percentage. It is important to mention the fact that, if the indirect tax revenues evolution trend would be compared with the total fiscal revenues evolution trend almost identical tendencies would be underlined with a noticeable decrease in revenues between 2007 and 2009. The minimum value recorded in 2009 as GDP percentage was 12,6% and the maximum value recorded in consecutive years: 2014, 2015 and 2016 as GDP percentage was 13,6%. There is also important to take into consideration the difference between every national country fiscal system.

**Figure 3.** Standard VAT rates in EU-28 countries in 2017

**Source:** Author's processing based on *vatlive.com* data.

Figure 3 shows the standard VAT rates in all of the 28 EU state members. Hungary is the country which recorded a maximum VAT rate of 27% and Luxembourg is the country with a minimum rate of 17%.

### 3. Literary review

In the last few years, specialty studies regarding public finances focused mainly on highlighting the effects of the fiscal policies on economic growth. Moreover, the development and improvement of econometric models facilitated the analysis of the social and economical impact of taxes.

**Afonso A. (2010)** analysed the effect regarding the volatility and size of governmental revenues and expenditures in EU and OECD state members concluding that both variables are unfavourable to economic growth. Also, the author confirmed that indirect taxes and governmental expenditures have a significant, negative impact upon economic growth.

Among the first authors who focused on studying the relation between taxation and economic growth it is important to mention **Easterly and Rebelo. (1993)** who determined a robust but weak connection between fiscal policy and economic growth. **Mendoza et al. (1997)** used in their study a Panel regression model for 18 OECD state members, setting up the research on the macroeconomic measures of the effective tax rates of income and consumption and suggesting that there is a weak, significant connection between fiscal policy and long-term economic growth. Still on OECD countries (22 states, 1970-1995 period) and using an endogenous growth model, **Kneller et al. (1999)** testified that distortionary taxes reduce economic growth while non-distortionary taxes do not reduce it, but governmental expenditures used in a productive condition encourage such growth while non-productive governmental expenditures discourage it.

On the same note regarding OECD countries, **Macek R. (2014)** assessed the impact upon economic growth of various taxes by using a regression model for 2000 – 2011. In accordance with the model proposed by **Mankiw, Romer and Veil (1992)**, the independent variables the authors used were: GDP per capita (real GDP); RINV or capital accumulation, HUM or human capital, GOV (public expenditures as GDP percentage) and tax (taxation rate adjusted with a TQ rate and a taxation index: World Tax Index, WTI). The results confirmed the hypothesis that capital accumulation positively helps growth until it reaches a state of stability. Moreover, in accordance with the human capital impact on economic growth, the author emphasised on a theoretical correlation which implies the fact that people with secondary education represent a long-term source of economic growth. However, the conclusion regarding public expenditures and their economic impact did not highlight valid or significant results.

From another point of view, **Arnold J. et al (2011)** developed a study in which they identified the fiscal policies that urged the end of the financial crisis and contributed to the long-term economic growth. Their research was based on the long-term impact of fiscal revenues structure on GDP in OECD countries. The econometric model consisted in an error correction model for 21 countries and the main conclusion is that economic growth is sustained through adjusting the taxation base to consumption and immovable property.

For South Africa case, **Koch et al. (2005)** investigated the relation between taxation and economic growth for a period of time between 1960 and 2002. The authors studied the indirect taxes effects on economic growth and suggested that an increase of the indirect taxes value would lead to a decline in economic growth. **Mgbame C.O and Ilaboya O.J (2012)** developed as well a study which emphasizes on the economic growth based on indirect taxation in developing countries by considering Nigeria as a reference point. The empirical model is based on a series of error correction mechanisms which includes procedures such as two-step Engle-Granger (used in order to test short-term effects) and Autoregressive Distributed Lag (ARDL) to correct the discrepancies between the short-term impact and long-term impact of variables. The conclusion highlighted a negative, insignificant correlation between indirect taxes and economic growth in Nigeria. **Myles G.D. (2009)** determined that consumption taxes imply a more reduced level in negatively affecting economic growth than direct taxes.

#### 4. Research methodology and database

In order to evaluate the impact of indirect taxes on economic growth, an econometric model based on a set of factors which influence the dependent variable was approached. The study is performed by using data referring to EU – 28 state members for 15 years (2002 – 2016). The indirect taxation effects are analyzed by using a Panel data model with 28 cross-sections and 420 observations which efficiently accentuates the variables effects. The variables description and sources are presented in Table 1. In addition, to estimate the econometric regression I used EViews 7 software.

The econometric investigation is based on a regression equation which encompasses as the dependent variable the econometric growth or the real GDP growth rate (PIB\_grate). The GDP growth rate (value expressed as current prices, euro millions) was computed by dividing the previous GDP value (previous to the reference year) to the reference GDP value. On the other hand, the independent variables consist of indirect taxes, budgetary expenditures and a control variable.

The following are the independent variables:

- a) Value Added Tax (TVA), as percentage of total fiscal revenues;
- b) Excises and other consumption taxes (Acc\_impcons), considered as well as percentage of total fiscal revenues;
- c) Budgetary expenditures (Ch\_guv), as percentage of GDP;
- d) Corruption perception (Corr\_index; values are logarithmed), considered as a main triggering factor to instability in economic affairs; this variable is based on the Corruption Perception Index (CPI), a composed index which measures, through questionnaires, the level of corruption perceived by the population of different 183 countries; it is measured with a score from 0 (very corrupt country) to 100 (very low corrupt country)

**Table 1.** *The variables*

Variable		Description	Source
I. Dependent Variable			
PIB_grate	GDP Growth Rate		Online Eurostat Database
II. Independent Variables			
1. Variables regarding indirect taxes			
TVA	Value Added Tax as percentage of total fiscal revenues		Online Eurostat Database
Acc_impcons	Excises and consumption taxes as percentage of total fiscal revenues		
2. Variables regarding the size of public expenditures			
Ch_guv	Budgetary expenditures as percentage of GDP		Online Eurostat Database
3. Control variable			
Corr_index	This variable is based on the Corruption Perception Index (CPI), a composed index which measures, through questionnaires, the level of corruption perceived by the population of different 183 countries; it is measured with a score from 0 (very corrupt country) to 100 (very low corrupt country). Values are logarithmed.		The Heritage Foundation online database

**Source:** Author's processing based on Eurostat data.

#### Regression equation:

$$\text{PIB\_grate}_{it} = \alpha + \beta_1 \cdot \text{TVA}_{it} + \beta_2 \cdot \text{Acc\_impcons}_{it} + \beta_3 \cdot \text{Ch\_guv}_{it} + \beta_4 \cdot \text{Corr\_index}_{it} + \varepsilon_{it}.$$

Where i stands for the analyzed countries (EU – 28) and t is the year (2002-2016).

## 5. Empirical results analysis

The descriptive statistics of the variables are displayed in Table 2, therefore the economic growth rate in the EU-28 between 2002-2016 recorded a medium value of 2,75%. Moreover, the minimum value of growth rate was in Latvia: -23,01% and the maximum value of 31,36% was recorded in 2007 by Latvia too. On the other hand, the VAT as percentage of total fiscal revenue had a medium value of 21,42% between 2002 and 2016 with Bulgaria recording in 2006 the maximum value of 34,9%. In contrast with Bulgaria, Spain is one country which recorded in 2009 a percentage of 12,7% of the fiscal revenues. The excises and other consumption taxes recorded a medium value of 7,86%.

**Table 2.** Descriptive statistics

	ACC_IMPCONS	CH_GUV	CORR_INDEX	PIB_GRATE	TVA
Mean	0.078638	0.449440	1.775300	0.027560	0.214238
Median	0.081000	0.449000	1.799341	0.025685	0.209000
Maximum	0.189000	0.651000	2.000000	0.313668	0.349000
Minimum	0.004000	0.271000	1.414973	-0.230160	0.127000
Std. Dev.	0.034160	0.063938	0.139006	0.049059	0.047677
Probability	0.002431	0.175853	0.000015	0.000000	0.000000
Observations	420	420	420	420	420

**Source:** Author's processing using EViews 7.

The regression equation estimation was performed by using the Least Squares Method. Moreover, because Panel model data might be heterogenous I ran the Hausman test and subsequently I decided to use fixed effects in order to highlight the correlation between the variables.

**Table 3.** Hausman test

Correlated Random Effects - Hausman Test			
Test period random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	24.944282	4	0.0001

**Source:** Author's processing using EViews 7.

The econometric analysis consists of 420 observations (annual values, 2002-2016) and the parameters testing hypothesis are:  $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4$ ;

$H_1$ : there is at least one  $\beta_i \neq 0$ .

**Table 4.** Regression results (fixed effects)

Dependent Variable: PIB_GRATE				
Method: Panel Least Squares				
Sample: 2002 2016				
Periods included: 15				
Cross-sections included: 28				
Total panel (balanced) observations: 420				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.595338	0.091169	6.530066	0.0000
ACC_IMPCONS	-0.841366	0.194147	-4.333649	0.0000
CH_GUV	-0.632878	0.061403	-10.30703	0.0000
CORR_INDEX	-0.184131	0.045339	-4.061180	0.0001
TVA	0.512109	0.150983	3.391823	0.0008
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.438297	Mean dependent var		0.027560
Adjusted R-squared	0.393418	S.D. dependent var		0.049059
S.E. of regression	0.038209	Akaike info criterion		-3.618352
Sum squared resid	0.566456	Schwarz criterion		-3.310523
Log likelihood	791.8539	Hannan-Quinn criter.		-3.496684
F-statistic	9.766322	Durbin-Watson stat		1.627256
Prob(F-statistic)	0.000000			

**Source:** Author's processing using EViews 7.

**Table 5.** *Independent variables coefficients and probabilities*

Independent variables	Coef	Prob
C	0.595338	0.0000
TVA	0.512109	0.0008*
Acc_impcons	-0.841366	0.0000*
Ch_guv	-0.632878	0.0000*
Corr_index	-0.184131	0.0001*

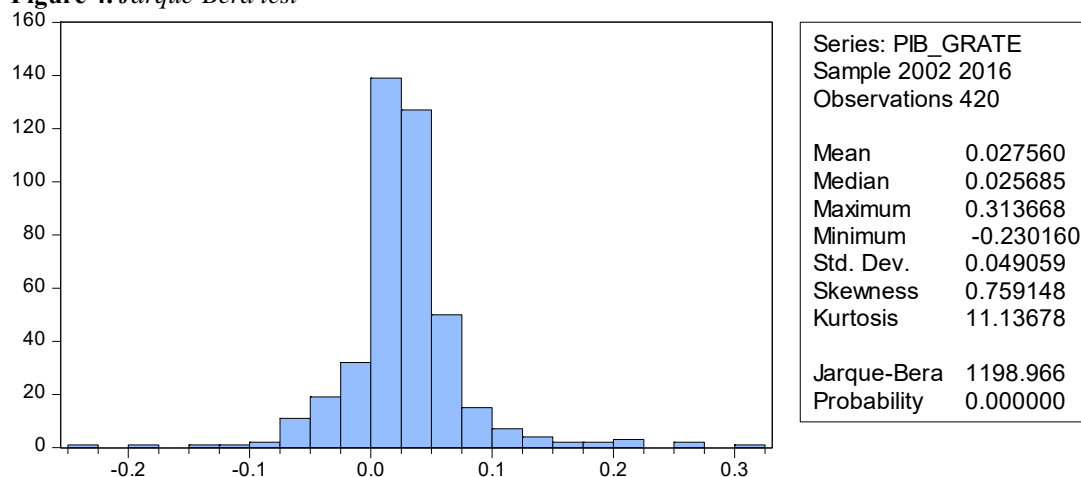
**Source:** Author's processing using EViews 7.

**Legenda:** \*1% significance level.

The estimated  $\beta_1$  coefficient associated with TVA variable (VAT as percentage of total fiscal revenues) highlights a positive connection between VAT and economic growth; therefore, an increase with one percentage point in VAT would lead to an increase of 0,51% in economic growth. In contrast, the coefficients associated with budgetary expenditures (Ch\_guv) and excises and other consumption taxes (Acc\_impcons) show negative values which underline a negative correlation with the dependent variable. Thus, an increase with one percentage point in budgetary expenditures or excises and other consumption taxes lead to a decrease in GDP growth rate with 0,63% and 0,84%.

On the other hand, the control variable associated with the corruption perception index is negatively correlated with the dependent one, so an increase with one percentage point of the index leads to a decline in the economic growth with 0,18%.

The econometric estimation output is illustrated in Table 4. R squared highlights that 43,82% of the economic growth variation is explained by the independent variables variation (R-squared adjusted is 39,34%). The model is valid because the F test probability is 0,0000 ( $H_0$  is rejected: the model is invalid; but with a probability of 99,9999% the model is valid). The correlation coefficient,  $r$ , computed as  $\sqrt{R^2}$  has the value of 0,66204 and points a strong relation between the variables.

**Figure 4.** *Jarque-Bera test*

**Source:** Author's processing using EViews 7.

The Jarque-Bera test proves that whether the sample data has skewness and kurtosis. Hypothesis:  $H_0$ : Skewness = 0; Kurtosis = 3  $\Rightarrow$  normal distribution;  $H_1$ : Skewness  $\neq$  0 and/or Kurtosis  $\neq$  3  $\Rightarrow$  not a normal distribution. In such case, the values regarding economic growth are not from a normal distribution.

## 6. Conclusions

The present paper analyzes and highlights the impact upon economic growth of one of the most used indirect taxes for a period of time from 2002 – 2016 for EU – 28 countries. The econometric model considers indirect taxes (VAT, excises and other consumption taxes),

budgetary expenditures and a control variable which measures the corruption perception. The results of the regression showed that all of the independent variables have a significant impact on the dependent one. Moreover, the empirical analysis leans towards determining positive correlation on the economic growth but with only a small proportion of results showing positive impact. Conclusions are justified by the GDP size, corruption perception index and the efficiency level of one country fiscal system. Additionally, budgetary expenditures lead to an economic decline and corruption index is perhaps defined by the level of trust that the population has in a stable economical and political system, unaffected by corruption.

---

## References

---

- Afonso, A. and Furceri, D., 2010. Government size, composition, volatility and economic growth, *European Journal of Political Economy*, 26, pp. 517-532.
- Arnold, J., Brys, B., Johansson, A., Heady, C., Schwellnus, C. and Vartia, L., 2011. Tax policy for economic recovery and growth, *The Economic Journal*, 121 (February).
- Barro, R.J., 1990. Government spending in a simple model of endogenous growth, *Journal of Political Economy*, 98(S5), pp. 103-125.
- Easterly, W. and Rebelo, S., 1993. Fiscal Policy and Economic Growth: An Empirical Investigation, *Journal of Monetary Economics*, 32, pp. 417-458.
- Kneller, R., Bleaney, M. and Gemmell, N., 1999. Fiscal policy and growth: evidence from OECD countries, *Journal of Public Economics*, 74, pp. 171-190.
- Koch, S.F., Schoeman, N.J. and Van Tonder, J.J., 2005. Economic Growth and the Structure of Taxes in South Africa: 1960-2002, *South African Journal of Economics*, 73(2), pp. 190-210.
- Macek, R., 2014. The Impact of Taxation on Economic Growth: Case study of OECD Countries, *Review of Economic Perspectives*, VOL. 14, Issue 4, 2014, pp. 309-328.
- Mankiw, G., Romer, D. and Weil, D., 2012. A Contribution to the Empirics of Economic Growth. *The Quarterly Journal of Economics*, 107 (2), pp. 407-437.
- Mendoza, E., Milesi-Ferretti, G. and Asea, P., 1997. On the Ineffectiveness of Tax Policy in Altering Long-Run Growth: Harbeger's Superneutrality Conjecture, *Journal of Public Economics*, 66, pp. 99-126.
- Mgbame, C.O. and Ilaboya, O.J., 2012. Indirect Tax and Economic Growth, *Research Journal of Finance and Accounting*, Vol. 3, No. 11.
- Myles, G.D., 2009. Economic Growth and the Role of Taxation – Aggregate Data, *OECD Economics Department Working Papers*, No. 714, OECD publishing.
- Solow, R.M., 1956. A Contribution to the Theory of Economic Growth, *The Quarterly Journal of Economics*, Vol. 70, No. 1, pp. 65-94.
- <[http://ec.europa.eu](http://ec.europa.eu;);>
- <<http://www.vatlive.com>>



# The impact of government health and education expenditure on income inequality in European Union

**Ionuț JIANU**

Bucharest University of Economic Studies, Romania  
ionutjianu91@yahoo.com

**Abstract.** *This research aims to provide an overview of the existing inequalities and their drivers in the member states of the European Union as well as their developments in the 2002-2008 and 2009-2015 sub-periods. It also analyses the impact of health and education government spending on income inequality in the European Union over the 2002-2015 period. In this context, I applied the Estimated Generalized Least Squares method using panel data for the 28-member states of the European Union.*

**Keywords:** inequality, income, education, health, unemployment.

**JEL Classification:** D63, I14, I24.

## 1. Introduction

One objective of the European Union agenda consists in the economic, social and territorial cohesion and recalls the higher social purpose of the European model of integration than that of the American or the Asian model. However, national social realities vary widely between the EU member states in terms of education, health, income, and employment.

The social situation does not represents only a source for expansion of the mandate of politicians and received a special attention from the European citizens in the recent years. According to the European Commission (Reflection paper on the social dimension of Europe), 8 of 10 European citizens see unemployment, social inequalities and migration as the main challenges of the European Union. More than 50% of Europeans also believe that the next generation will be exposed to more difficult situations. In this context, the situation of social imbalances (income inequalities) across the European Union are one of the most widely debated concepts in recent years. Income inequality is natural given that people are naturally different, have different capacities, visions, concerns, and different behaviors. For example, people's adaptability to the labour market favors high wage earnings, while rigidities in the workforce can lead to wage cuts. Rigid labour is limited in terms of the manifestation of wage discontent and, in the case of a wage cut, the employee will respect the management decision, while flexible workforce can present other employment opportunities to the management in the wage negotiation process, which can lead even to an increase of the wage of the employee by the management.

The motivation for choosing this theme consists mainly in the intensification of the economic debates on this topic, especially those related to pros and cons of income inequalities. Some researchers consider income inequality to be beneficial (given the wage disparities resulting from the different performances of the population on the labour market), while other economists support their reduction. Also, social concern regarding income gap and the methods used in order to reduce it represents an additional motivation for choosing this theme.

The objective of the paper is the examination of the situation of income inequalities in the European Union and the assesment of the impact of government health and education expenditures on income inequalities, the robustness of the assessment being strengthened by the integration of other control variables into the analysis.

## 2. Literature review

Even if many studies were made in this area, the results have sometimes been contradictory. Some economists see income inequality as an undemanding preoccupation of economists, while others consider the social sphere to be an illustration of the economic policies implemented.

According to the European Commission (2010), the socio-economic inequalities recorded in the post-2000 years were higher than those recorded in 1980, despite the economic growth achieved by the European Union. Social and human capital development policies did not have the desired impact on income inequalities due to the high labour polarization, this being a result of economic modernisation and labour market deregulation.

Eurofund (2017) analysed the evolution of pre-crisis and post-crisis incomes inequalities and found that the European Union has made significant progress in terms of convergence by 2008, but in the post-crisis period some efforts have been canceled by the impact of the economic and financial crisis that has spread stronger economic shocks in the peripheral states of the European Union than in developed member states using effective adjustment mechanisms. The impact of the crisis on the convergence process has also led to a significant decline in incomes across the European Union. The Eurofund (2017) also found that

unemployment is the main channel by which the economic downturn has increased income inequality in the European Union, affecting different categories of population.

On the other hand, a series of studies (Benabou, 2000, 2002; Bleaney, Gemmell and Kneller, 2001) highlighted the pro-growth and pro-income inequality character of some public expenditure categories, such as: government expenditure on health and education, and government expenditure on infrastructure. However, other categories of expenditure may offer inadequate incentives, which implies assuming some compromises in the budget execution.

Dabla-Norris et al. (2015) identified the improvement of educational qualifications, removing financial barriers to third-country education and providing support for apprenticeship programs as factors that improve the quality of the education system and have a significant impact on income inequality. Also, in the OECD (2012) vision, educational policies that increase graduation rates in upper secondary education and in tertiary education play a fundamental role in reducing income inequality. The Organization believes that structural reforms in the labour market and those that enhance the quality of the education system are key factors in moderating income inequalities.

According to O'Donnell et al. (2013), health can influence the distribution of income through several channels, including through the one related to labour market. In this context, the labour productivity of people suffering from certain diseases is lower, which leads, generally, to lower wages. Discrimination is also another factor that can deepen income inequality between people with disabilities and healthy people. On the other hand, some researchers have also shown that the increase in income inequality is associated with high mortality (Wagstaff and Doorslaer, 2000), homicide and violence (Lynch et al., 2001). In this context, this reverse causality relationship brings significant challenges to a country in the event of an increase in income inequality, which can only be addressed by implementing effective structural reforms on the labour market (including education structural reforms).

Ward et al. (2009) demonstrated the existence of a positive relationship between the unemployment rate and the level of income inequality in the European Union. At the same time, Boltanski and Chiapiello (2005) found that labour mobility, and its adaptability, are included into the category of labour market specificities that influence income inequality. In their view, rigidity of the workforce has unfavorable consequences on the income distribution, since workers who are not willing to change their residence in order to find a better job are susceptible to comply with their modest activity and to accept lower wages.

As regards the measurement of income inequality through the Gini coefficient, Solt (2016) found that most of the statistical data sources providing this indicator is dealing with data comparability and coverage issues. In many cases, the national Gini coefficients provided by international databases are computed through different methodologies or the number of observations is low, numerous data missing from the samples. The author mentioned the only source that publishes the Gini coefficient (The Luxembourg Income Study), computed on the basis of a uniform set of definitions and assumptions, respectively on the basis of harmonised microdata that ensures maximization of their comparability. In this context, the Standardized World Income Inequality Database uses the Luxembourg Income Study standardized data series. On the other hand, the missing data was computed through the 5-year weighted moving average algorithm, the uncertainty of the results being reduced by the Monte Carlo simulation and application of the algorithm for each simulation.

### 3. Methodology

This section presents the research methodology for quantifying the impact of government health and education spending on income inequalities in the European Union. For this purpose, I used yearly data for the 2002-2015 period for each member states of the European Union (392 initial observations) as follows:

**Table 1.** *Statistical data series used*

Indicators	Sursa datelor
Gini coefficient	The Standardized World Inequality Database and OECD for Italy (2015 year) and Luxembourg (2015 year)
Government expenditures on health (% of GDP)	Eurostat
Government expenditures on education (% of GDP)	Eurostat
Wages (% of GDP)	Eurostat
Unemployment rate (%)	Eurostat

**Source:** Own processings using Microsoft Office Word 2016

Statistical data on income inequality, defined in this paper through Gini coefficient, are limited and the integration of this variable into an econometric model may be difficult. Eurostat does not cover the entire analysis period for this coefficient (2002-2015) and it has been necessary to consult another credible statistical platform for this indicator. I chose to use the data provided by the Standardized World Inequality Database given that the authors of the study created a new harmonised database for the Gini coefficient from several statistical sources (international studies and scientific research). Thereby, I obtained a complete set of the indicator, excepting the data for 2015 (Italy and Luxembourg - for which I used OECD data). Also, the method used maximizes the comparability of data between countries. The analysis period was limited to 2015 due to missing data for general government expenditure by function for 2016 at Eurostat level.

In the first phase I analysed the evolution of the five indicators (Table 1) in the European Union on two sub-periods: 2002-2008 and 2009-2015. The second sub-period aims to surprise the evolution of indicators during the economic crisis and the first sub-period captures the evolution of the indicators in the pre-crisis period.

In the step of identifying the influence factors and equation estimation method, I tested the stationarity of the variables through the "Summary" technique, which provides an overview of the main stationary tests: (i) Common root - Levin, Lin & Chu, (ii) Individual root - Im, Pesaran and Shin, (iii) Common root Breitung, (iv) Individual root - ADF-Fisher and (v) Individual PP-Fisher root. The variables used proved to be stationary at level and at first difference, which argued the use of the autoregressive term in the equation. Afterwards, I processed the data in Eviews 9.0 software to estimate the impact of the education and health expenditures of government on the Gini coefficient. For this purpose, I used EGLS - Estimated Generalized Least Squares method in panel window. In order to increase the feasibility of the method used, I applied the Period SUR option (for the ex-ante correction of heteroscedasticity and of the general correlations between the cross sections) on the following estimated equation:

$$\text{Gini} = \alpha_0 + \beta_0 \text{Gini}_{t-1} + \beta_1 \text{health}_{t-1} + \beta_2 \text{education}_{t-1} + \beta_3 \text{wages}_t + \beta_4 \text{un}_t + \varepsilon_t \quad (1)$$

where: *Gini* capture income inequality,  $\text{Gini}_{t-1}$  represents the autoregressive term,  $\text{health}_{t-1}$  and  $\text{education}_{t-1}$  surprise government health and education spending lagged by one year (expressed as a share of GDP), *wages* and *un* represents the contribution of wages to GDP, respectively the unemployment rate and  $\varepsilon_t$  is the error term. Also,  $\alpha_0$  represents the coefficient of the constant and  $\beta_{1-4}$  captures the impact coefficients of the exogenous variables on Gini. For independent variables, I selected the lags according to the specificities of the economic theory.

Following the estimation of the equation, it was necessary to identify the method of estimating the effects. The use of autoregressive term rejects the random effects method. To confirm this

hypothesis, I used Hausman test which indicated the rejection of this method. To identify the extent to which the Fixed Effect Method is appropriate for this model, I used the Redundant fixed effects test. However, dealing with issues related to multicollinearity or autocorrelation of residuals or heteroskedasticity, depending on the structure of the equation, the number of cross sections and the number of observations, may suggest using a standard panel model without fixed or random effects. Although the Fixed Effect method proved to be appropriate (Redundant fixed effects test), I rejected this technique because Period SUR option (used to correct heteroscedasticity and general cross-sectional correlations) could not be applied. I have also not been able to apply an alternative option (Cross-section SUR) given that the number of observations per cross-section (14) is less than the number of cross-sections (28) - Eviews software does not allow such an estimation.

A number of 364 observations resulted from the adjustments made for the application of this method. Further, in order to test the main assumptions for the validation of this model, I performed the following tests:

- (i) F test (verifying the statistical validity of the model);
- (ii) Jarque-Berra (examination of the normal distribution of the residuals);
- (iii) Breusch-Godfrey (testing the autocorrelation of residuals);
- (iv) Breusch-Pagan and Pesaran CD (testing cross-section dependence);
- (v) Breusch-Pagan-Godfrey (testing of heteroskedasticity);
- (vi) Klein's criterion (testing for multicollinearity).

Given that the panel window do not support heteroskedasticity and autocorrelation tests, I used the theoretical framework to obtain the results of these tests. Thus, for testing the autocorrelation of residuals (iii), I estimated the following equation:

$$\text{res1} = \gamma_0 + \delta_0 \text{Gini}_{t-1} + \delta_1 \text{health}_{t-1} + \delta_2 \text{education}_{t-1} + \delta_3 \text{wages}_t + \delta_4 \text{un}_t + \text{res1}(-1) + \text{res1}(-2) + \varepsilon_t \quad (2)$$

where: res1 represents the residuals from the initial estimated model, and res1(-1) and res1(-2) represent the series of residuals lagged by one and two years.

In order to evaluate the probability of the autocorrelation test, I used the Microsoft Office Excel 2016 function - CHISQ.DIST.RT, a function that took into account: a) the product of the R-squared corresponding to the equation (2) and the number of observations, respectively b) the degrees of freedom (number of lags for res1).

As regards, the heteroskedasticity test (v), I estimated the following equation:

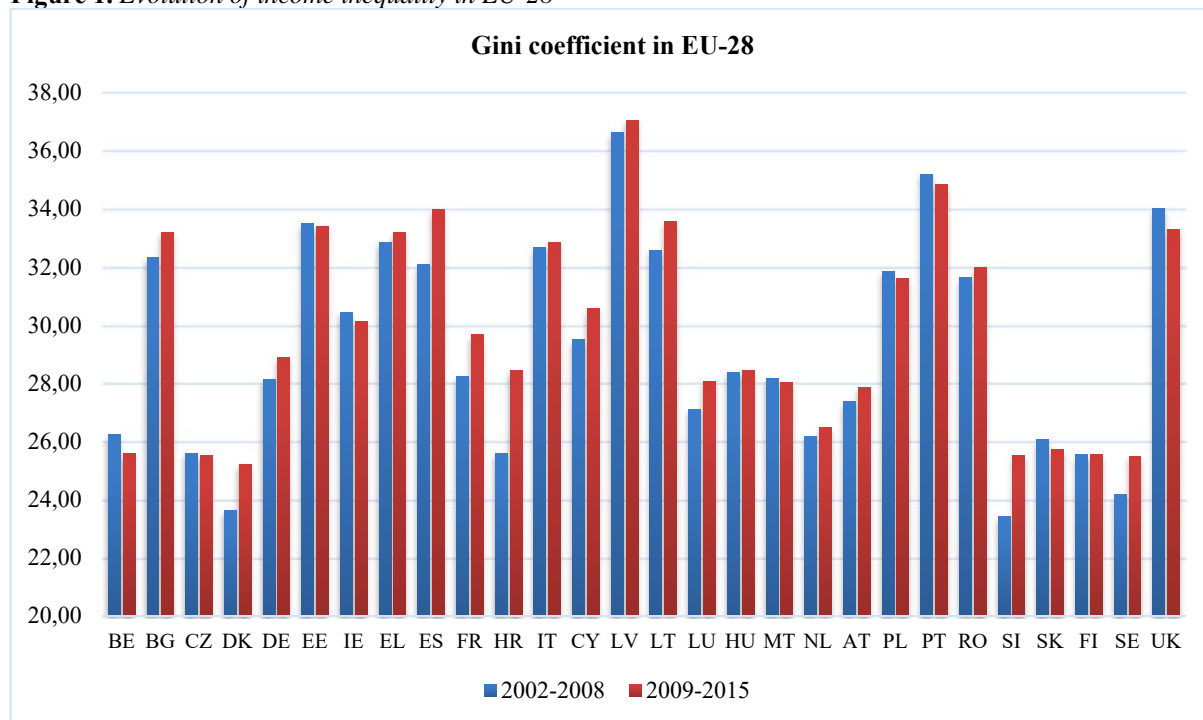
$$\text{res1}^2 = \lambda_0 + \mu_0 \text{Gini}_{t-1} + \mu_1 \text{health}_{t-1} + \mu_2 \text{education}_{t-1} + \mu_3 \text{wages}_t + \mu_4 \text{un}_t + \varepsilon_t \quad (3)$$

where  $\text{res1}^2$  represents the square of the residuals resulting from the initial estimated model.

Finally, I used the CHISQ.DIST.RT function to evaluate the probability of the heteroskedasticity test. The function involved the following factors: a) the product of the R-squared corresponding to equation (3) and the number of observations, respectively b) the degrees of freedom (the number of independent variables, excluding the constant).

#### 4. Results and interpretations

In this section I analysed the dynamics of the Gini coefficient in the European Union during 2002-2015, as well as its explanatory factors. Finally, I estimated the impact of government education and health spending and other control variables (the influence of the autoregressive term, the unemployment rate and the contribution of wages to GDP formation) on income inequality.

**Figure 1.** *Evolution of income inequality in EU-28*

**Source:** Own calculations using Standardized World Inequality Database

Figure 1 shows that there are large differences between member states of the European Union in terms of income inequality. According to the Standardized World Inequality Database, in the post-crisis period, the European Union experienced a trend of increasing income inequalities (at the end of 2015, the European Union average of the Gini coefficient was 30.0). Also, I would like to mention that for all indicators analysed, I have processed their final value at European Union level, taking into account the year of accession of each member state to European Union. In this context, the average Gini coefficient for the 2009-2015 sub-period increased by 0.67 deviation points compared to the one recorded in the previous sub-period (from 29.16 to 29.83). In 2015, the highest Gini coefficient was recorded in Latvia (36.8), Portugal (34.8) and Spain (34.3), while the lowest levels of the indicator have been observed in Denmark (25.4), Czech Republic (25.5), Slovakia (25.5) and Finland (25.5). In the 2009-2015 sub-period, only 9 states recorded decreases in the indicator compared to the 2002-2008 sub-period, while 19 experienced increases. The most significant increases in income inequality were recorded in Croatia (2.86 deviation points), Slovenia (2.11 deviation points) ) and Spain (1.90 deviation points). On the other hand, all the 9 countries that have experienced cuts in the indicator in the second sub-period recorded insignificant decreases, below 1 deviation points. As can be seen, in most of the EU member states, the crisis had a negative impact on the income gap.

**Table 2.** *The commitment to reducing inequality rank (152 countries)*

Country	Commitment to reducing inequality	Health, education and social protection expenditure	Progressive structure and incidence of tax	Labour market policies to address inequality
Sweden	1	9	8	8
Belgium	2	4	3	24
Denmark	3	8	9	12
Germany	5	2	17	6
Finland	6	3	23	10
Austria	7	6	40	1
France	8	5	19	21
The Netherlands	9	19	13	9
Luxembourg	10	12	21	11
Ireland	13	1	53	19
Italy	16	17	14	29

Country	Commitment to reducing inequality	Health, education and social protection expenditure	Progressive structure and incidence of tax	Labour market policies to address inequality
United Kingdom	17	28	31	5
Portugal	19	18	29	30
Slovenia	20	13	56	22
Malta	22	37	2	26
Czech Republic	24	10	104	14
Greece	25	11	60	46
Spain	27	16	48	55
Hungary	28	21	85	32
Cypru	31	42	38	27
Slovakia	32	23	128	20
Croatia	33	44	32	39
Poland	35	22	121	38
Estonia	38	26	127	43
Latvia	46	31	145	28
Romania	50	57	132	31
Bulgaria	79	52	144	44
Lithuania	83	49	141	49

**Source:** Own processings using data from Development Finance International and Oxfam „The Commitment to Reducing Inequality Index”, July 2017

However, the inclusive feature of the European integration model is also reflected in the positions occupied by the member states of the European Union in a ranking made by the Development Finance International in partnership with the international confederation of charities - Oxfam (the inequality reduction commitment index). As can be seen, the ranking (Table 2) is in line with the situation of income inequalities (Gini) in the member states of the European Union, the countries recording high levels of Gini index being also among the countries that make insufficient efforts to reduce income inequalities. The first countries in the world that make full efforts to reduce income inequality through government spending on health, education and social protection, progressive taxation and tax incidence, respectively labour market policies are Sweden, Belgium and Finland. On the other hand, Romania, Bulgaria and Lithuania occupy the last three places in the European Union from the point of view of the commitment to reduce income inequality.

The economic crisis has also played a decisive role in the dynamics of income inequality. According to Eurostat, in 2009, the EU-28 GDP fell by 4.3%, evolution accompanied by a large budget deficit of 6.6% of GDP, which required the adoption of fiscal consolidation policies by the member states. Although member states adopted austerity policies, many of these has not reduced the share of government spending on education and health in GDP. Annex 1 highlights the developments at European level in the 2002-2008 and 2009-2015 sub-periods regarding government expenditure on education and health, unemployment rate and wages. As regards government education expenditures in European Union, their share in GDP of 4.84% in 2015 was the lowest value in the analysed period. However, the average of the indicator for the 2009-2015 sub-period was higher than the one recorded in the previous sub-period by 0,08% of GDP. In 2015, Romania has recorded the lowest government spending on education (% of GDP), followed by Ireland, Bulgaria and Italy. On the other hand, the member states of the European Union spending the most on education are: Denmark, Sweden, Belgium and Finland. In the 2009-2015 sub-period, only 8 countries reduced the share of government education spending in GDP compared to the values recorded in the 2002-2008 sub-period, the most significant being: Hungary (-0.71% of GDP), Romania (-0.54% of GDP) and Poland (-0.53% of GDP). The most significant increases in education spending were found in Denmark (+0.63% of GDP), Luxembourg (+0.54% of GDP) and Belgium (+0.53% of GDP).

The dynamic of government health expenditure highlighted the same preference of member states for rising expenditure in the second sub-period, with only 5 countries of European

Union opting for a decrease in this budgetary function: Hungary (-0.37% of GDP), Portugal (-0.27% of GDP), Greece (-0.26% of GDP), Bulgaria and Malta (both -0.13% of GDP). This preference of member states for increasing government health expenditure also facilitated an increase of the aggregate indicator at European Union level by 0.7% of GDP in the 2009-2015 sub-period, compared to the value recorded in the previous sub-period. The most significant increases in the second sub-period analysed were recorded in the Netherlands (+2.04% of GDP), Finland (+1.31% of GDP) and the UK (+1.31 of GDP). In 2015, Denmark, France and the Netherlands had the highest government health spending, while Cyprus, Latvia and Romania made the lowest government health spending from the European Union.

Some countries have laid the foundations of fiscal consolidation on reducing government social expenditures and thus, the income gap has further increased. However, unemployment had a strong influence on income discrepancies. Even if the unemployment rate at EU level in the analysed period has reached a maximum level in 2013 (10.93%), its level is still high (9.42% in 2015) and poses an important challenge for the European Union as a whole. In the post-crisis period (2009-2015), the EU average unemployment rate was higher than in the previous period by 1.82 percentage points (from 8.08% to 9.90%).

According to Eurostat, in 2015 the highest unemployment in the European Union was recorded in Greece (24.9%), Spain (22.1%) and Croatia (16.1%), while the lowest level of this indicator was found in Germany (4.6%), Czech Republic (5.1%) and the United Kingdom (5.3%). Only in seven EU member states unemployment rate declined in the 2009-2015 sub-period compared to the previous one. The largest decline was found in Poland (-6.14 percentage points), followed by Germany (-3.61 percentage points) and Slovakia (-1.77 percentage points). On the other hand, the highest increases in unemployment were recorded in Spain (+12.21 percentage points), Greece (+11.11 percentage points) and Ireland (+8.23 percentage points). At first glance, it may be said that the rise in unemployment has led to the jobs loss of individuals with higher incomes too, and income inequality should not have changed. However, people who lost their jobs and previously earned better than other individuals, have been able to use their savings to generate a substitute income for their wage achieved in the past.

Unemployment also affected vulnerable groups, especially the people who have attained the International Standard Classification of Education taxonomic classes - ISCED 0-2 (less than primary, primary and lower secondary education) and ISCED 3-4 (upper secondary and post-secondary non-tertiary education). In this context, the EU-28 unemployment rate of the 15-74 age group who attained ISCED 0-2 increased in 2009 from the level recorded in 2008 by 3.2 percentage points, reaching 14.4%. On the other hand, the unemployment rate of the 15-74 age group with ISCED level 3-4 in the EU-28, increased by 1.8 percentage points, from 6.5% in 2008 to 8.3 % in 2009. Regarding the population with tertiary education (ISCED 5-8), the economic recession led to an increase in the unemployment rate by 1.1 percentage points in 2009 (4.9%), compared to the rate recorded in the previous year, which also argues the higher resilience to economic shocks of these categories of people.

As regards the share of wages in GDP, the indicator was constant during the analysed period and fluctuated around 37% of GDP. However, there were large discrepancies between the indicator recorded at the level of each member state. As a result, in 2015, the highest share of wages in GDP was recorded in Denmark (47.9% of GDP), Slovenia (41.7% of GDP) and Luxembourg (41.5% of GDP) while Ireland (24.8% of GDP), Greece (25.0% of GDP) and Romania (27.3% of GDP) had the weakest position of the indicator. In the second sub-period analysed, the largest increases of the contribution of wages to GDP formation compared to the previous sub-period were found in Bulgaria (+5.11% of GDP), Cyprus (+2.74% of GDP) and Finland (+2.56% of GDP). Contrariwise, Romania (-3.37% of GDP), Ireland (-2.43% of GDP)



and Portugal (-1.87% of GDP), recorded the largest decline in the average of the indicator processed for the sub-period 2009-2015, compared to the previous sub-period.

As the increasing evolution of inequalities poses new challenges to the social dimension of the European Union, in the second phase of the research, I assessed the impact of the drivers of income inequalities on the Gini coefficient. Initially, I checked the stationarity of the variables included in the model (using the Summary method mentioned in the methodology - the lag being automatically chosen by Eviews software using the Schwarz information criterion), these being stationary at level and first difference, which required the inclusion of the Gini coefficient lagged by 1 year in the regression. Therefore, following the examination of the stationarity tests, I obtained the following results:

- Gini coefficient - stationarity identified at I(1);
- government expenditure on health as a share of GDP - stationarity identified at I(1);
- government expenditure on education as a share of GDP - stationarity identified at I(0);
- unemployment rate - the use of the Summary method did not provide a clear picture of the results (the number of tests that identified stationarity at I(0) was equal to the number of tests that identified stationarity at I(1)); Consequently, I applied the Hadri test for both level and first difference of unemployment rate. I rejected the stationarity assumption for I(0) as the probability of 0% was below the 5% threshold. The probability of 56% associated with Hadri Z-stat for I(1) argued the acceptance of the null hypothesis of stationarity. Finally, I have identified stationarity at I(0);
- contribution of wages to GDP formation - stationarity identified at I(1).

Next, I estimated the model, starting from the structure previously presented and I analysed its results. According to Figure 2, all variables used are statistically significant, their probability being less than the significance threshold of 5%. However, the risk of the estimator of the constant to be null is greater than 5% and less than 10% (8.21%), but this does not raise any questions with respect to the appropriate representation of the model given that the coefficient of determination (R-squared) is high, which demonstrates that the dynamic of the selected independent variables explains 99.72% of the dependent variable variance. Also, the low standard errors have increased the confidence in estimators. In order to check the validity of the model, I used the F-test and its associated probability created the premises for confirming the statistical validity of the model.

The analysis of the impact coefficients of the variables included in the model is based on the "caeteris-paribus" hypothesis. According to the results of the model attached in Figure 3, the increase of the Gini coefficient recorded in the previous year by 1 deviation point leads to an increase of the actual Gini coefficient by 0.989 deviation points, this being also caused by the higher yield of higher incomes (people who earn higher income than other categories of people may use these additional resources to generate other types of income, a situation that lead to an increase in income gap).

Returning to the main focus of the analysis, I identified a negative impact of the increase in government education and health expenditure on the Gini coefficient in the European Union. Thus, I found that an increase in government health expenditure in the previous year by 1% of GDP leads to a decrease by 0.019 deviation points in the Gini coefficient, a lower impact than the one manifested through government education expenditure channel (an increase of 1% of GDP in government education expenditure lagged by one year led to a decline of 0.024 deviation points in Gini coefficient). Education offers to population the opportunity to alling with people who earn high income, within certain limits, through knowledge. Supporting education through higher funding, (one condition of it being the effectiveness of the structural reforms) can stimulate young people's insertion on labour market or their involvement in sustainable projects. However, the effects of the investments in education are not observed on the short term. This budget function generates new sources of income for the population by

offering opportunities on the medium or long term, reason for which I included the 1-year lagged series on the list of the independent variables. This is also the case of government health expenditure that support education over time. In general, there is a significant link between education and health, since an educated person tends to take care of his health condition and a healthy person has the ability to continue his studies, not being constrained by factors related to weak health condition. Also, a healthy person does not face health barriers in the accession on the labour market and its performances are not conditioned or limited by the current condition of health. However, this is not a rule, the career success also depending on the severity of the health problem and other specific psychological factors.

According to Figure 2, an increase of the contribution of wages to the GDP formation by 1% of GDP leads to an increase of the Gini coefficient by 0.007 deviation points. This effect can be caused by the fact that in many countries from the European Union wage hikes occurred unequally, favouring the population earning high wages.

The estimate shows a positive impact of 0.011 deviation points on the Gini coefficient at a 1 percentage point increase in the unemployment rate, based on the higher impact of unemployment on vulnerable groups.

The coefficient of the constant term shows that, when all components of the equation remain constant, the Gini coefficient increases by 0.268 deviation points. However, given that the level of R-squared is high and the risk of the estimator to be null is greater than 5%, I ignored its coefficient as it can be inaccurate.

**Figure 2.** *Results of the model*

Dependent Variable: GINI				
Method: Panel EGLS (Period SUR)				
Sample (adjusted): 2003 2015				
Periods included: 13				
Cross-sections included: 28				
Total panel (balanced) observations: 364				
Linear estimation after one-step weighting matrix				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI(-1)	0.988523	0.003412	289.6816	0.0000
HEALTH(-1)	-0.019482	0.007470	-2.607897	0.0095
EDUCATION(-1)	-0.023601	0.010690	-2.207825	0.0279
WAGES	0.007654	0.002276	3.362277	0.0009
UN	0.011262	0.002475	4.549447	0.0000
C	0.268036	0.153712	1.743752	0.0821
Weighted Statistics				
R-squared	0.997218	Mean dependent var	126.3769	
Adjusted R-squared	0.997179	S.D. dependent var	94.80012	
S.E. of regression	0.996300	Sum squared resid	355.3557	
F-statistic	25661.19	Durbin-Watson stat	1.996223	
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.995730	Mean dependent var	29.55577	
Sum squared resid	19.62285	Durbin-Watson stat	0.898298	

**Source:** Own calculations using Eviews 9.0

As can be seen in Figure 3, the residuals are normally distributed, given that the probability of Jarque-Bera test is higher than 5% (52.46%).

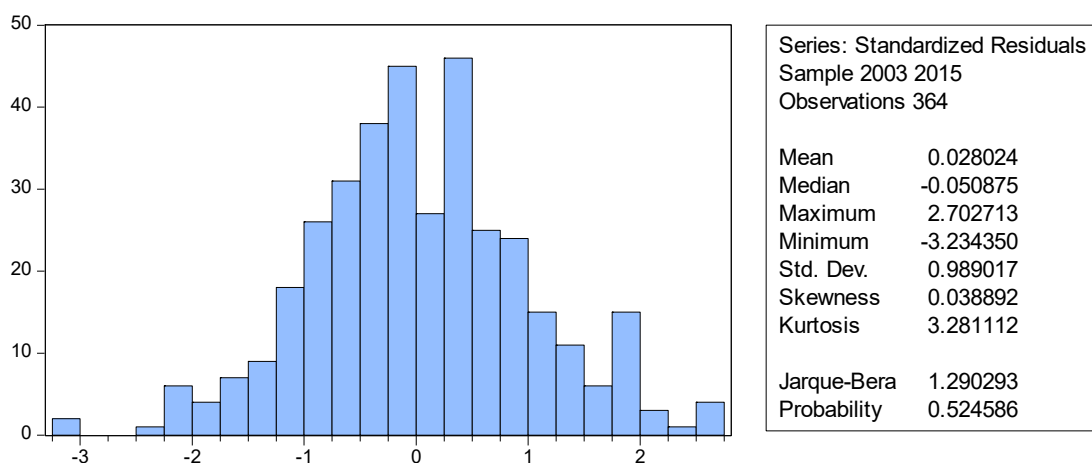
In order to test the autocorrelation of the residuals, I did not use the Durbin-Watson test as it became invalid when I introduced the autoregressive term, as an exogenous variable, in the panel model. In this context, I performed the Breusch-Godfrey test (Annex 2), starting from equation (2) which includes 2 degrees of freedom (the number of lags for residuals) and a number of 308 observations (following the adjustments performed) and I obtained a R-

squared value of 0.012849 and a  $n \cdot R$ -square value of 3.957586. Using the CHISQ.DIST.RT function and previously processed data, I computed the probability of the Breusch-Godfrey autocorrelation test (13.82%), which argued the acceptance of the hypothesis according to which there is not autocorrelation between the residuals.

For enhancing the examination of the model's accuracy, I performed the cross-section dependence tests: Breusch-Pagan and Pesaran CD. Both the Breusch-Pagan (100.00%) and the Pesaran CD test (63.76%) are superior to the significance threshold of 5%, which confirms the absence of cross-section dependence.

The verification of heteroskedasticity (Annex 3) involved the estimation of the equation (3) and the computation of the probability of Breusch-Pagan-Godfrey test based on the  $n \cdot R$ -squared value ( $364 \cdot 0.012786 = 4.6541049$ ) and the degrees of freedom taken into consideration ( $5 - \text{number of exogenous variables}$ ). Therefore, I accepted the hypothesis of homoskedasticity since the Breusch-Pagan-Godfrey probability of 45.95% is higher than 5%.

**Figure 3.** *Distribution of the residuals*



**Source:** Own calculations using Eviews 9.0

Concerning multicollinearity, I accepted the hypothesis related to its absence from the model, since the Pearson statistical correlations between the exogenous variables are lower than the coefficient of determination of the equation (1) - the Klein criterion.

Finally, I validated the model and its coefficients, given that there is no reason to have doubts on the maximum verisimilitude of the estimators.

## 5. Conclusions

This paper targeted the estimation of the impact of government health and education expenditure on income inequality. According to the results, a 1 percentage point increase in government health expenditure (express as a share of GDP) leads to a reduction in the Gini coefficient by 0.019 deviation points in the next year, while the same dynamic of government education expenditure causes a decrease of Gini coefficient by 0.024 deviation points in the next year. Therefore, this analysis confirms the inverse relationship between these two functions of budget expenditures and income inequality. The analysis of the EU member states' commitments to reduce inequalities has also confirmed this hypothesis. The model has proved to be statistically valid, all the tests performed in order to confirm the maximum verisimilitude of the estimators providing results that were in the normal parameters.

Supporting social cohesion through government spending on education and health is essential, but it is necessary to make it more effective by implementing structural reforms that bring both social and economic benefits outweighing the budgetary costs resulting from the

implementation of these measures. Spending public money inefficiently can have negative consequences on the living standards of future generations, given that at some point the population will have to comply with their obligations resulted from high public debt, as a consequence of large budget deficits.

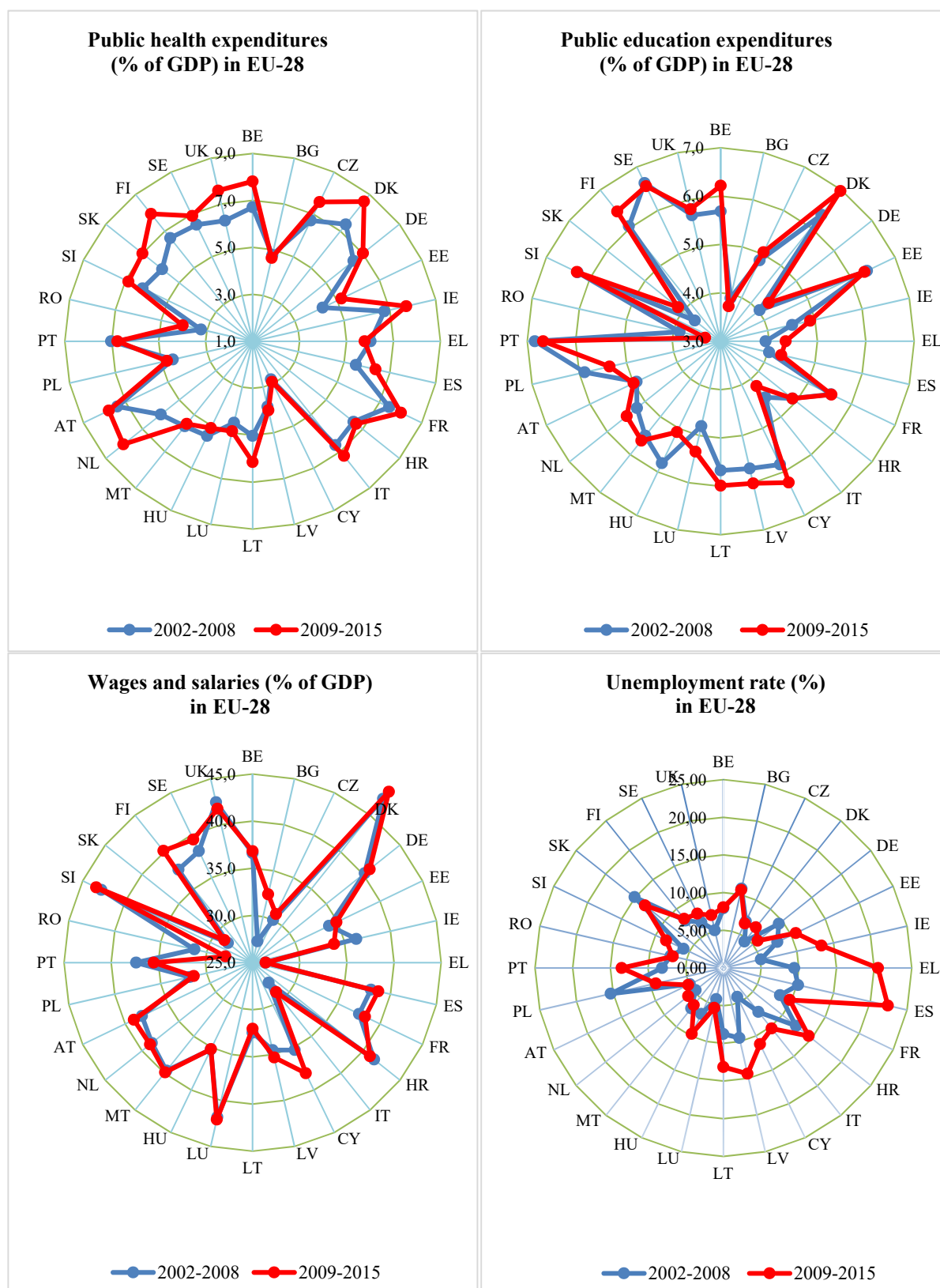
At both European Union and Romanian level, it is necessary to identify an optimal threshold of income inequality, a lower level than it - representing the natural income inequality and a higher level than the threshold - being the inequality induced by the national institutions and governments. In this context, for European Union member states it would be beneficial to assess the impact of budgetary measures on income distribution in the context of the annual budget proposals and to prevent the accumulation of disparities between incomes (for instance, Finland have such an approach, even if this activity is not mandated by law). Otherwise, there is a risk that the actual level of income inequality will continue on a increasing trend.

---

## References

---

- Benabou, R., 2000. Unequal Societies: Income Distribution and the Social Contract. *American Economic Review*, Vol. 90, No. 1, pp. 96-129.
- Benabou, R., 2002. Tax and Education Policy in a Heterogeneous-Agent Economy: What Levels of Redistribution Maximize Growth and Efficiency?. *Econometrica*, Vol. 70, No. 2, pp. 481-517.
- Bleaney, M., Gemmell, N. and Kneller, R., 2001. Testing the Endogenous Growth Model: Public Expenditure, Taxation, and Growth Over the Long Run. *Canadian Journal of Development Economics*, Vol. 34, No. 1, pp. 36-57.
- Boltanski, L. and Chiapello, È., 2005. *The New Spirit of Capitalism*. Verso: London.
- Dabla-Norris, E., Kochhar, K., Ricka, F., Suphaphiphat, N. and Tsounta, E., 2015. Causes and Consequences of Income Inequality: A Global Perspective. *IMF Staff Discussion Note*, No. 15/13.
- Development Finance International and Oxfam, 2017. The Commitment to Reducing Inequality Index. *Oxfam International and Development Finance International Research Report*.
- Eurofound, 2017. *Income inequalities and employment patterns in Europe before and after the Great Recession*. Publications Office of the European Union: Luxembourg.
- European Commission, 2010. Why Socio-economic Inequalities Increase? Facts and Policy Responses in Europe. *Directorate General for Research, Socio-economic Sciences and Humanities Research*.
- Eurostat, 2017. Eurostat Database. [online]. available at: <<http://ec.europa.eu/eurostat/data/database>> [Accessed 19 December 2017].
- Harvard Dataverse, 2017. The Standardized World Income Inequality Database [online] available at: <<https://dataverse.harvard.edu/dataset.xhtml?persistentId=hdl:1902.1/11992>> [Accessed 19 December 2017].
- Lynch, J., Smith, G. D., Hillemeier, M., Shaw, M., Raghunathan, T. and Kaplan, G., 2001. Income Inequality, the Psychosocial Environment, and Health: Comparisons of Wealthy Nations. *Lancet*, Vol. 358, No. 9277, pp. 194-200.
- O'Donnell, O., van Doorslaer, E. and van Ourti, T., 2013. Health and Inequality. *Tinbergen Institute Discussion Paper*, No. 13/170/V.
- OECD, 2012. *Economics Policy Reforms: Going for Growth*. OECD Publishing: Paris.
- OECD, 2017. OECD stat. [online]. available at: <<https://stats.oecd.org/>> [Accessed 19 December 2017].
- Solt, F., 2016. The Standardized World Income Inequality Database. *Social Science Quarterly*, Vol. 97, No. 5, pp. 1267-1281.
- Wagstaff, A. and Doorslaer, E., 2000. Income Inequality and Health: What does the Literature Tell Us?. *Annual Review of Public Health*, No. 21, pp. 543-567.
- Ward, T., Lelkes, O., Sutherland, H. and Tóth, I. G., 2009. *European Inequalities: Social Inclusion and Income Distribution in the European Union*. TÁRKI Social Research Institute: Budapest.

**Annex 1.** The dynamic of government health and education expenditure, wage share in GDP and unemployment rate in the EU-28

**Source:** Own calculations using Eurostat database

**Annex 2. Autocorrelation of the residuals test - Breusch-Godfrey**

Dependent Variable: RESID01

Method: Panel EGLS (Period SUR)

Sample (adjusted): 2005 2015

Periods included: 11

Cross-sections included: 28

Total panel (balanced) observations: 308

Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI(-1)	0.002436	0.020108	0.121149	0.9037
HEALTH(-1)	0.013366	0.045458	0.294031	0.7689
EDUCATION(-1)	0.011475	0.069190	0.165854	0.8684
WAGES	0.002688	0.014205	0.189244	0.8500
UN	-0.024565	0.014500	-1.694139	0.0913
C	-0.063632	0.903669	-0.070415	0.9439
RESID01(-1)	-0.006266	0.056106	-0.111683	0.9111
RESID01(-2)	0.008319	0.056097	0.148303	0.8822
Weighted Statistics				
R-squared	0.012849	Mean dependent var	0.016518	
Adjusted R-squared	-0.010184	S.D. dependent var	1.007006	
S.E. of regression	1.011935	Sum squared resid	307.2035	
F-statistic	0.557853	Durbin-Watson stat	1.998322	
Prob(F-statistic)	0.789857			
Unweighted Statistics				
R-squared	0.006179	Mean dependent var	0.022359	
Sum squared resid	297.3885	Durbin-Watson stat	1.995710	

**Source:** Own calculations using Eviews 9.0**Annex 3. Heteroskedasticity test - Breusch-Pagan-Godfrey**

Dependent Variable: RESID01^2

Method: Panel EGLS (Period SUR)

Sample (adjusted): 2003 2015

Periods included: 13

Cross-sections included: 28

Total panel (balanced) observations: 364

Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI(-1)	0.014939	0.018358	0.813753	0.4163
HEALTH(-1)	0.003934	0.045262	0.086920	0.9308
EDUCATION(-1)	-0.068923	0.065222	-1.056748	0.2913
WAGES	0.026728	0.013392	1.995764	0.0467
UN	0.016312	0.015968	1.021556	0.3077
C	-0.252463	0.860992	-0.293224	0.7695
Weighted Statistics				
R-squared	0.012786	Mean dependent var	0.813186	
Adjusted R-squared	-0.001002	S.D. dependent var	1.089608	
S.E. of regression	1.004172	Sum squared resid	360.9932	
F-statistic	0.927335	Durbin-Watson stat	1.988804	
Prob(F-statistic)	0.463184			
Unweighted Statistics				
R-squared	-0.002726	Mean dependent var	0.976252	
Sum squared resid	794.8883	Durbin-Watson stat	1.761169	

**Source:** Own calculations using Eviews 9.0

# Determinants of fiscal discipline in Romania – the IMF and the EU

**Phd. Student Sandina Maria JELOAICA**

Bucharest University of Economic Studies, Romania

sandinajeloica@gmail.com

**Abstract.** *Romania's fiscal conduct during the last 27 years was significantly influenced by external factors, both directly and indirectly.*

*This paper focuses on the direct impact on fiscal conduct derived from its membership at the International Monetary Fund and European Union, also looking at the results, in comparison with four other member states (Poland, Bulgaria, Czech Republic and Hungary).*

**Keywords:** Romania, fiscal discipline, IMF, European Union.

**JEL Classification:** H600.

## Introduction

Romania's fiscal conduct during transition was directly influenced by external factors. The world has significantly changed after 1990 (the fall of the Soviet Union, a reunified Germany, globalization, .com revolution, the Great Recession - just to mention few aspects of the global framework). As a transition economy, Romania had to both change its economic structure (especially moving from public to private property) and catch up with the developed economies that at were also following new challenges and market rules.

But Romania was not acting that independently. Actually, we can speak about the decisions of an independent state that were actually strongly influenced by its adjustment programs agreed with the International Monetary Fund (since the very beginning of its transition period, namely since 1991) and the European Union (EU) membership (since 2007, but its influence could be felt since the beginning of the accession negotiations: 1999, at the Helsinki Conference).

The relation with the IMF and its impact was assessed in some papers (Bălăceanu, Apostol, 2012; Imam, 2007), but the focus on its discipline has not been studied separately and in conjunction with the EU relation. Also, the relation with the EU from this perspective has not yet been assessed in the literature.

This paper aims for a qualitative assessment of the impact of these two institutions on its fiscal discipline, looking at the official documents that were assumed by the governments, as well as the macroeconomic developments. The importance of the fiscal discipline was described in Section 1 of the paper "Twenty Years of Stability and Growth Pact" (Jeloaica, 2017) and the relevance in the context of external shocks were further revealed by Voinescu (2018) that showed a limited size of the fiscal multipliers in case of Romania, so the extremely week possibility to of the fiscal policy to incentivize the economic activity.

In order to make it more relevant, I decided to compare Romania's relations with both the IMF and the EU with the relation other comparable member states (Bulgaria/BG, Czech Republic/CZ, Hungary/HU and Poland/PL) developed during these years.

Section 1 provides information on the Romania's relation with the IMF during the first 26 years as a free market economy (1990-2016). Section 2 tackles the framework and conditions derived from the relation with the EU. Section 3 looks at GDP, debt and deficit developments, in order to assess if the relation with the 2 institutions had an impact on the fiscal conduct, so that in the we can draw some conclusions in the end.

## Section 1 – Romania and the IMF

Romania has been an IMF member since 15th of December 1972. Since then, 13 agreements were concluded, out of which 10 after 1990 (and these are to be assessed in the present paper in relation to their influence on the fiscal discipline).

The main purpose of the International Monetary Fund "is to provide a framework that facilitates the exchange of goods, services, and capital among countries, and that sustains sound economic growth, and that a principal objective is the continuing development of the orderly underlying conditions that are necessary for financial and economic stability, each member undertakes to collaborate with the Fund and other members to assure orderly exchange arrangements and to promote a stable system of exchange rates" (Art. 4, Section 1 of the Agreement of the International Monetary Fund). There are no clear numerical rules that the members need to apply in order to discipline their fiscal conduct, but the Fund significantly influences the states' policies by the loan conditions (indeed, agreed with the member states that benefit from financial support. It worth mentioning that national ownership

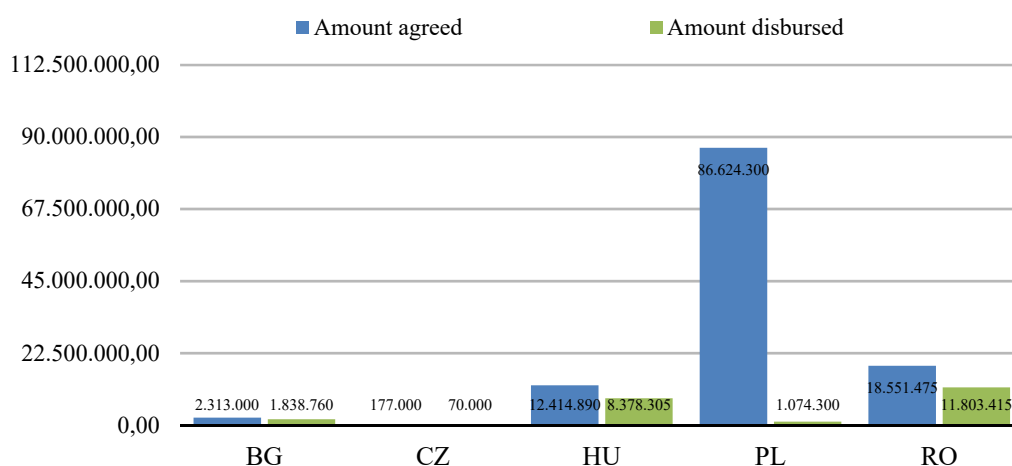


was enhanced since 2009 IMF lending reforms, thus we can say that up to then the lender's influence was stronger).

In this regard, the IMF MONA (Monitoring of Fund Arrangements) database provides a good overview of the impact on fiscal discipline. 98.65% of the 815 agreements concluded after 2002 (this includes the reviews as well) include conditions in the field of fiscal revenues, and 91.41% on public expenditures.

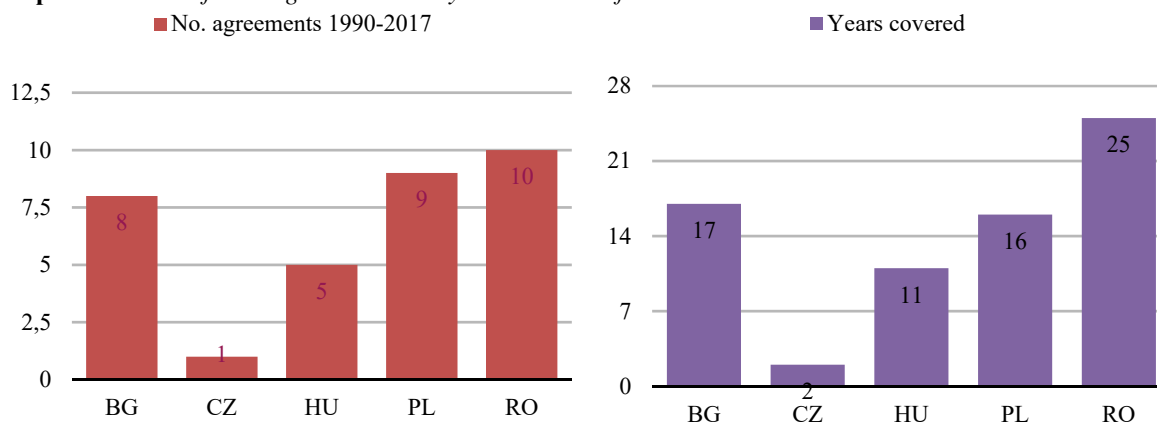
Coming back to Romania, the figures for the 28 years of democracy are as follows: 10 agreements, 11.803.415 million SDR disbursed, 25 years covered by agreements with the IMF – the strongest relation with the IMF if we look at comparable states (BG, CZ, HU, PL).

**Graph 1.** Value (SDR) of IMF arrangements after 1990 for selected states



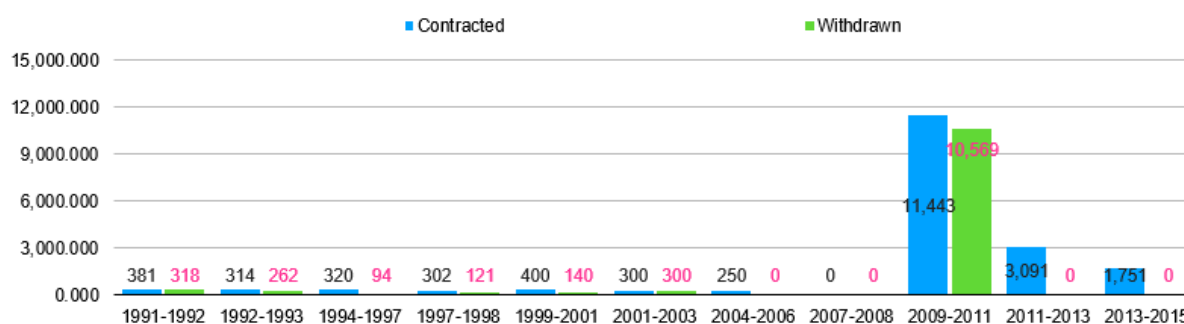
Source: own calculation based on data from [www.imf.org](http://www.imf.org).

**Graph 2.** Number of IMF agreements and years covered after 1990 in selected member states



Source: own calculation based on data from [www.imf.org](http://www.imf.org).

**Graph 3.** The 10 arrangements of Romania with the IMF after 1990



Source: own calculation based on data from [www.imf.org](http://www.imf.org).

The figures below indicate that Romania had the greatest number of arrangements with the IMF (10), closely followed by Poland and Hungary. But when we look at the time coverage, Romania had by far the closest relation if we are to compare with the other member states in the sample (25 years comparing with Bulgaria, that comes second with 17 years), so the greatest influence of the IMF on its development.

When looking into the amounts disbursed, Romania is again leading, but in order to have a full picture we need to take into consideration that compared with the average real GDP at market prices (91,1099.9 mil. Eur. from 1994 to 2016 if we are to use Eurostat database), it represents less than 0.05% of GDP (a rough estimation if we are to convert SDR to EUR using today exchange rate). The same applies for the other four countries as well, so we can state that the highest impact came from shaping policies and markets credibility and not the amounts as such.

This brings us to the policy conditions – the main influence factor on the national policies. The 10 arrangements mentioned above had comprehensive conditions attached, but if we restrain our assessment area these can be summed up in the table below:

Economic area	Main issues to be tackled
<i>Before joining the EU (1991 – 2006)</i>	
Tax/expenditure reform	Adoption of the pension law; reduce public sector employment; adoption of public debt law; adoption of profit tax law; passage of satisfactory yearly budgets; widening tax base; removing tax exemptions.; limiting monthly wage allocations for state budget; implement budgetary monitoring system; moratorium on granting investment incentives; implement wage brackets for August-December 1999; modification of investment incentives; limiting the economy-wide minimum wage; eliminate the excise tax reduction for producers of cigarettes using domestic tobacco; increase in excise taxes for gasoline and alcohol products and in the specific tax on beer; approval of the new VAT and profit tax laws; binding quarterly paths for the wage bill and employment reduction for monitored companies; implementation of layoffs in selected companies; elimination of custom duty and VAT exemptions for raw materials for small and medium-sized enterprises; establishment of a tax administration department within the Ministry of Public Finance and appointment of the responsible Secretary of State.
Public enterprises	Cutting arrears; reducing losses; implementation of management contracts; restructuring; privatization; approval of state owned enterprises budgets; eliminating the VAT and excise duties exemptions for selected state owned enterprises.
<i>After joining the EU (2009-2015)</i>	
Fiscal transparency	Fiscal responsibility legislation; publish up-to-date financial statements of all public hospitals on a webpage of the Ministry of Health; publishing monthly arrears reports and corrective measures being taken by the central and local governments, by unit, on a quarterly basis, publishing monthly arrears reports and corrective measures being taken by the central and local governments, by unit, on a quarterly basis; prepare and publish consolidated general government accrual based financial statements and ESA95 based reports from the system (the first sets of reports will be for the year ending 2014), and reconcile with each other and with cash-based budget execution reports.
Budget preparation	Approval of the yearly budgets; roll out the consolidated fiscal reporting system to all government entities.
Revenue and expenditures measures	Tax administration reform; fiscal measures to reduce expenditures; revised pensions legislation; institutional reforms measures to mitigate fiscal risks from local governments and SOEs; integrate the accounting reporting system with the Treasury payment system; ensuring central government and social security arrears at near zero; reform tax administration methodology for high net wealth individuals; stocktaking of arrears and unpaid bills for the entire general government and SOEs; review of the existing investment portfolio; which will prioritize and evaluate existing projects; introduction of a simplified taxation system for smaller taxpayers under the threshold; comprehensive amendments to the health care legislation to address the persistent budgetary shortfalls; enact the copayment law and the revised claw back tax law in the healthcare system; simplified tax system for the smaller taxpayer; integrate the accounting reporting system with the Treasury payment system; fully operationalize the commitment control system.
Public enterprises	Preparation of strategic action plans for key SOEs, restructuring, privatization.

**Source:** IMF MONA – selected data.

The conditions related to fiscal discipline went quite deep into details and covered a wide range of topics: taxation system, budget preparation and execution (from the legislative part to the concrete revenues and expenditure measures), fiscal transparency (so the administrative part) but also decreasing the role of state in the economy by privatization (also a way of optimizing the budgetary costs). A special attention was paid to arrears, that represented a huge issue for Romania.

## Section 2 - The EU membership impact on Romania's fiscal discipline

First and foremost, we should mention that by signing the membership agreement (25th of April 2005 and taking effect starting with 1st of January 2007), Romania committed to respect the well-known “Maastricht criteria” on fiscal discipline: a budget deficit of maxim 3% of GDP and a public debt limited to 60% of GDP (art. 126 of the Treaty on Functioning of the EU, detailed in Protocol 12 annexed to the Treaty).

The subsequent EU legislation (mainly the Stability and Growth Pact/SGP), as well as the intergovernmental Treaty on Stability, Coordination and Governance in the Economic and Monetary Union/TSCG and the national legislation (mainly Law no.69/2010 on fiscal responsibility) goes in the same line, with fiscal numerical rules and EU fiscal surveillance process, as well as corrective procedures for not complying with the agreed rules (the excessive deficit procedure, the significant deviation procedure).

In order to better understand the framework, I will provide an overview of the fiscal conduct restrictions as derived from the EU membership, as well as Romania's degree of fulfillment.

Rule	Applicable since	Main provisions	Corrective measures	Observed by Romania
Debt rule*	1997 - SGP (operationalized in 2011 SGP reform)	the public debt should be limited to 60% of GDP	Excessive deficit procedure (EDP) - Potential sanction on the EU funds	The debt rule was never breached by Romania
Deficit rule*	1997 - SGP	public deficit should be limited to 3% of GDP	Excessive deficit procedure (EDP) - Potential sanction on the EU funds	In EDP from 2009 to 2013
Medium term budgetary objective (MTO)*	1997 - SGP (strengthened in 2011 SGP reform) 2012 / TSCG	budgets must be balanced or in excess	Significant deviation procedure (SDP) The correction mechanism should be automatically activated when departing from the MTO or the adjustment path towards it.	In SDP since 2017 (for 2016 outrun data). The correction mechanism was not automatically activated.
Expenditure rule**	2011 SGP reform stronger focus since 2016	the growth path of the government expenditure is being assessed against a reference medium term rate of potential GDP growth, in order to ensure the achievement of the MTO or the adjustment path towards it	Significant deviation procedure (SDP)	In SDP for significant deviation from the MTO in 2016, not for the expenditure rule. Still, since 2016 the expenditure rule was not observed by Romania.

\*In 1997, the Maastricht Treaty provisions on fiscal discipline were detailed and operationalized within the SGP (15 member states now). Thus, the fiscal discipline is monitored in the preventive arm (the provision is that the budgets must be balanced or in excess and the concept of MTO is introduced) and any deviation is corrected within the corrective arm (the excessive deficit procedure provides for the member state to take corrective measures and in case of failure sanctions can be imposed). The debt rule was actually operationalized in the 2011 SGP reform, since when the excessive deficit procedure may be launched in case of the breaching the debt rule as well.

\*\*The expenditure benchmark was introduced since 2011, but in December 2016 the ECOFIN Council decided that more focus should be placed on it.

Secondly, the fiscal discipline was promoted by the EU during the European Semester as well. In this process introduced in the 2010, the economic policies of the member states are being coordinated within the annual budgetary cycle. Policy orientations are proposed by the European Commission in the Annual Growth Survey (AGS), discussed at the Council of European Union level and endorsed by the heads of states and governments at European Council level. Then, based on the member states Stability/Convergence Programs and the National Reform Programs, the Council adopts country specific recommendations (CSR) in order to feed the national budgetary process. An overview of these recommendations is presented below:

Source	Provisions
AGS 2011	Rigorous fiscal consolidation for enhancing macroeconomic stability
CSR 2011	Implement the measures laid down in Council Decision 2009/459/EC as amended by Council Decision 2010/183/EU, together with the measures laid down in Council Decision 2011/288/EU and further specified in the Memorandum of Understanding of 23 June 2009 and its subsequent supplements, and in the Memorandum of Understanding of June 2011 and its subsequent supplements.
AGS 2012	Pursuing differentiated growth-friendly fiscal consolidation: implementing sound budgetary policies, tailored according to Member States' current fiscal positions; maintaining as far as possible investment in growth-enhancing areas; and making tax policies more growth-friendly
CSR 2012	Implement the measures laid down in Decision 2009/459/EC, as amended by Decision 2010/183/EU, together with the measures laid down in Decision 2011/288/EU and further specified in the Memorandum of Understanding of 23 June 2009 and its subsequent supplements, and in the Memorandum of Understanding of 29 June 2011 and its subsequent supplements.
AGS 2013	Pursuing differentiated, growth-friendly fiscal consolidation.
CSR 2013	Complete the EU/IMF financial assistance program; ensure growth-friendly fiscal consolidation and implement the budgetary strategy for the year 2013 and beyond as envisaged, thus ensuring achievement of the medium-term objective by 2015; improve tax collection by implementing a comprehensive tax compliance strategy and fight undeclared work, in parallel, explore ways to increase reliance on environmental taxes; equalize the pensionable age for men and women and underpin the pension reform by promoting the employability of older workers.
AGS 2014	Responsible and growth-friendly fiscal policies, in line with the Stability and Growth Pact, taking into account the particular national situation.
CSR 2014	Implement the EU/IMF financial assistance program by fully addressing the policy conditionality included in the Memorandum of Understanding of 6 November 2013 and its subsequent supplements that complements and supports the implementation of these country specific recommendations; implement the budgetary strategy for 2014; significantly strengthen the budgetary effort to ensure reaching the medium-term objective in 2015 in line with commitments under the Balance of Payments program and as reflected in the 2014 convergence program, in particular by specifying the underlying measures, and remain at the medium-term objective thereafter; improve tax collection by continuing to implement a comprehensive tax compliance strategy; stepping up efforts to reduce VAT fraud; fight undeclared work; reduce tax burden for low- and middle-income earners in a budget-neutral way; finalize the pension reform started in 2010 by equalizing the pensionable age for men and women.
AGS 2015	Responsible and growth-friendly fiscal policies, in line with the Stability and Growth Pact, taking into account the particular national situation.
CSR 2015	Take all the necessary measures to complete the financial assistance program; limit the deviation from the fiscal medium-term objective in 2015 to a maximum of 0.25% of GDP as specified under the 2013-15 balance-of-payments program and return to the medium-term objective in 2016; implement the comprehensive tax compliance strategy, strengthen verification control systems in order to tackle undeclared work, and push ahead with the equalization of the pensionable age for men and women.
AGS 2016	Responsible public finance.
CSR 2016	Limit the deviation from the medium-term budgetary objective in 2016 and achieve an annual fiscal adjustment of 0,5 % of GDP in 2017 unless the medium-term budgetary objective is respected with a lower effort; ensure the application of the fiscal framework and strengthen further tax compliance and collection; ensure that legislative initiatives do not undermine legal certainty and do not put at risk financial stability; if necessary, adopt measures that mitigate such risks.
AGS 2017	Responsible public finance.
CSR 2017	In 2017, ensure compliance with the Council recommendation with a view to correcting the significant deviation from the adjustment path toward the medium-term budgetary objective; in 2018, pursue its fiscal policy in line with the requirements of the preventive arm of the Stability and Growth Pact, which translates into a substantial fiscal effort for 2018. Ensure the full application of the fiscal framework; strengthen tax compliance and collection. Fight undeclared work, including by ensuring the systematic use of integrated controls.
AGS 2018	Responsible fiscal policies to support sustainability and convergence.

Thirdly, as anticipated reading the country specific recommendations, another tool for the EU to promote fiscal discipline in Romania were the 3 balance of payments (BoP) programs Romania benefited of from 2009 to 2015. If the general framework applies to the other member states as well, the financial assistance was used by Hungary only (one program from 2008 to 2010, 5.5 out of 6.5 bl. Euro disbursed).

BoP programme	Main provisions in the area of fiscal discipline
Financial assistance 2009-2011 3.5 billion €	<p>(a) adopting a clearly-set medium-term fiscal program designed to lower by 2011 the general government deficit to not more than the Treaty reference level of 3 % of GDP;</p> <p>(b) adopting and executing an amended budget for 2009 (by the second quarter of 2009), targeting a general government deficit of no higher than 5,1 % of GDP in ESA 95 terms;</p> <p>(c) reducing the public sector wage bill in nominal terms compared to the 2008 outcome by foregoing public sector wage increases (totaling 5 % in nominal terms) scheduled for 2009 (or equivalent further cuts in employment) and by reducing public employment, including by replacing only one of seven departing employees;</p> <p>(d) additional reductions in spending on goods and services and in subsidies to public enterprises;</p> <p>(e) improving the budgetary management by the adoption and implementation of a binding medium-term fiscal framework, establishing limits on budget revisions during the year, including fiscal rules and creating a fiscal council to provide independent and expert scrutiny;</p> <p>(f) reforming the public compensation system, including by unifying and simplifying the pay scales and reforming the bonus system;</p> <p>reforming key parameters of the pension system by moving towards indexation of pensions to consumer prices rather than wages, gradually adjusting retirement age beyond the currently agreed plans, especially for women, and phasing in pension contributions of groups of public employees currently excluded from such contributions.</p>
Precautionary 2011-2013 1.4 billion €	<p>(a) the adoption of budgets and the implementation of policies in line with clear fiscal targets for the fiscal years 2011 to 2013 that underpin the continued fiscal consolidation with a view to stabilizing the government debt to GDP ratio and put an end to the excessive deficit in line with the Council recommendations under the excessive deficit procedure;</p> <p>(b) the requirement to attain progressively more restrictive benchmarks for the reduction in government payment arrears both at central government and local government levels;</p> <p>(c) the introduction of an enhanced reporting system for the State-owned enterprises which are already part of the European system of accounts definition of the general government, and also for those which will likely be reclassified into the general government sector by Eurostat in 2011 and 2012, with a view to enabling the government to assess on a continuous basis the likely impact on the general government deficit and the evolution of arrears, subsidies and transfers, and losses linked to these enterprises;</p> <p>(d) the continued monitoring of the public sector wage bill such that it respects the relevant limits set in the medium-term fiscal strategy;</p> <p>(e) the introduction of a means-tested co-payment system for medical services, as well as an adequate system of checks and controls against the accumulation of arrears in the health system;</p> <p>(f) the implementation of measures to improve the management of the public investment budget in line with the fiscal strategy 2012-2014 and with a focus on shifting from entirely domestically financed investment to Union co-financed investment;</p> <p>(g) the review, update and publication of a multiannual debt management strategy on an annual basis;</p> <p>(h) the implementation of policy measures aimed at rationalizing the wage-setting system with a view to allowing wage developments to better reflect productivity and reforms increasing the flexibility of labor contracts and working time arrangements within an integrated flexicurity approach.</p>
Precautionary 2013-2015 No review mission was concluded. 2 billion €	<p>(a) the adoption of budgets and the implementation of policies in line with the fiscal consolidation path derived from Romania's obligations under the Stability and Growth Pact with a view to reaching Romania's medium-term budgetary objective by 2015, and to maintaining it thereafter;</p> <p>(b) the full preservation of the measures agreed under the previous two program and the implementation of any remaining parts of yet unfulfilled conditionality;</p> <p>(c) the further strengthening of the fiscal governance framework, including through the implementation of the Treaty on Stability, Coordination, and Governance, so as to ensure that fiscal consolidation is well anchored. Particular attention shall be given to reinforcing multi-annual budgetary planning, to the implementation of an effective commitment control system, to improving tax collection, and to improving the capital budgeting process;</p> <p>(d) the implementation of the action plans adopted in response to the findings of the functional reviews carried out by the World Bank in 2010-2011 in a timely manner and the establishment of a central delivery unit to improve the government-wide policy prioritization;</p> <p>(e) the clearing of arrears and the strengthening of budget control mechanisms in the health sector through improved reporting and monitoring frameworks;</p> <p>(f) the implementation of the strategic action plan for healthcare, rationalizing the hospital structure and increasing the scope for primary care activities, in order to improve health outcomes;</p> <p>(g) the improvement of public debt management with a view to reducing risks and to consolidating and extending the yield curve for sovereign debt.</p>

As regards the EU surveillance and coordination of economic policies framework, this applies to all the EU member states (including Romania and the other four countries in the sample) and it plays an important role in maintaining the fiscal discipline, using both preventive and correcting tools.

As regards the preventive component (the so called Preventive arm of the Stability and Growth Pact), Romania was the first (and the only by now) country to be placed in significant deviation procedure (deviation from the path towards the Medium Term Budgetary Objective higher than 1.6% of GDP, namely a structural deficit of -2.6% of GDP).

As regards the excessive deficit procedure, all 5 countries in the sample were in excessive deficit procedure (meaning that the reference value of 3% of GDP was reached), as follows: BG from 2010 to 2012, Czech Republic from 2004 to 2008 and from 2009 to 2014, Hungary from 2004 to 2013, Poland from 2004 to 2008 and from 2009 to 2013 and Romania from 2009 to 2013.

Thus, all these countries received recommendations to keep their public finance onto a sustainable path and only Romania and Hungary had deeper involvement of the EU authorities by virtue of the Balance of Payments programs (6 years Romania, 2 years Hungary). The main areas were related to budget drafting and execution (including expenditures ceilings, expenditure reviews and tax reforms), reform of administration, debt management, state owned enterprises management (in order to reduce the budget pressure).

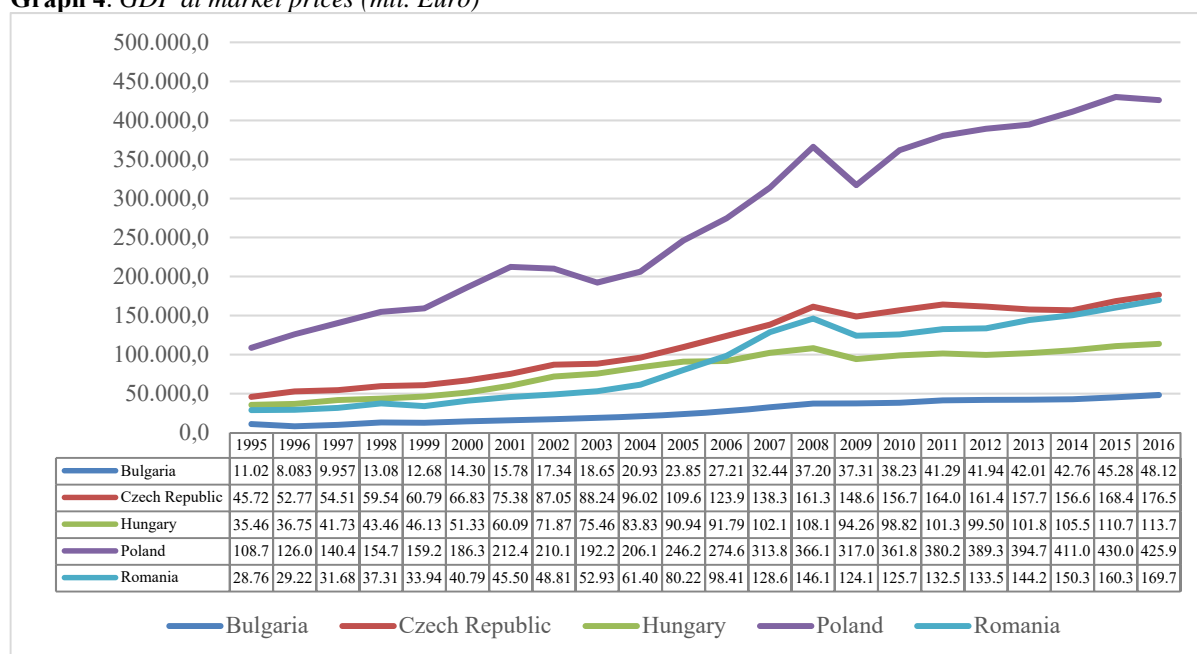
In the same time, significant developments of the economic governance framework took place, and I would underline here the Council Directive 85/2011 on requirements for budgetary frameworks of the Member States, that lays down detailed rules concerning the characteristics of the budgetary frameworks of the Member States needed for compliance with the Stability and Growth Pact requirements. The requirements refer to availability and quality of fiscal data, medium term budgetary frameworks, prudent forecasts and fiscal numerical rules.

### Section 3 – Economic developments

As showed in the previous sections, the five-member states were bounded by the same rules after joining the EU (2004 Hungary, Poland and Czech Republic and 2007 Romania and Bulgaria). Before EU accession, the IMF had impact on their fiscal discipline, but in different degrees, as the time during adjustment program varied across countries. This section aims to have a look at the economic developments during this period, by assessing the GDP, debt and deficit developments.

As regards the GDP developments, all the member states were on a positive trend since 1995 and were affected by the crisis, with economic decrease in 2009 and relaunch afterward. Up to 2009, the growth path seemed common to the five countries (see Graph 4 below).

**Graph 4.** GDP at market prices (mil. Euro)

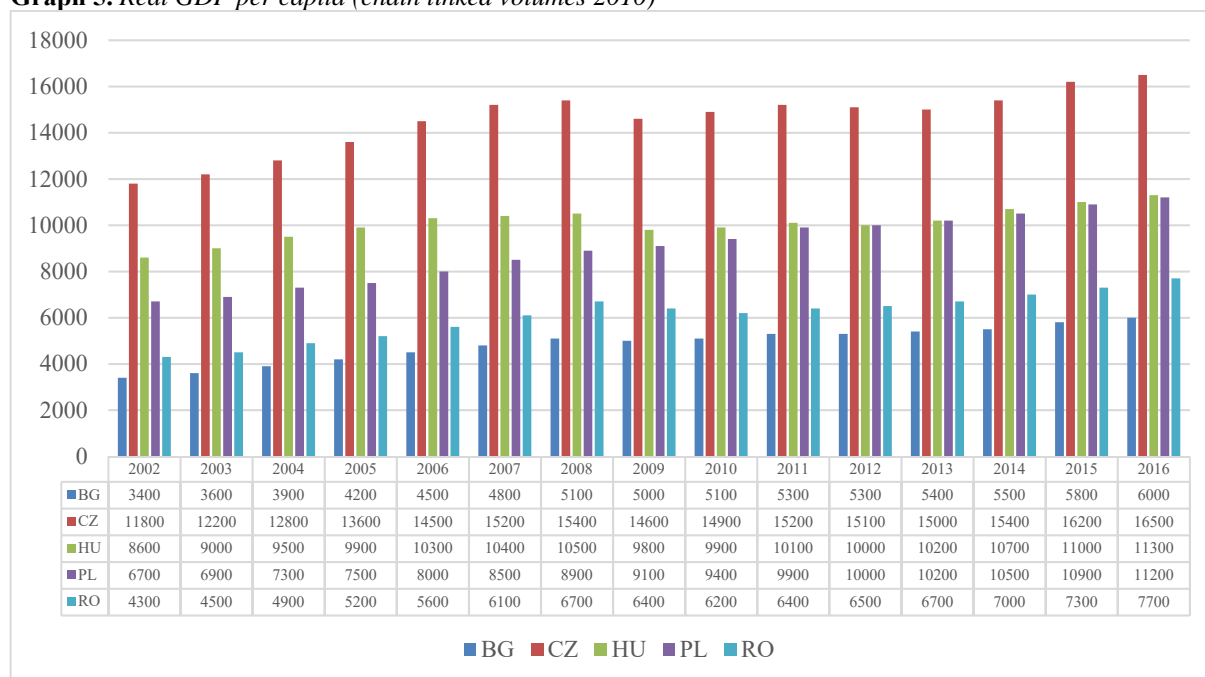


Source: Eurostat database.

If we are to look at Romania only, 2005-2008 was a period of sustained growth (from 61.40 mil. Euro in 2004 to 80,22 mil. Euro in 2005 and 146,1 mil. Euro in 2008), followed by the effects of the crisis in 2009 and a slow recovery afterwards (it reached the before crisis GDP only in 2014, so 5 years later). Only Hungary had such a slow recovery (Poland, Czech Republic and Bulgaria had better performances in this sense).

Of course, in order to have a better picture, a look at the real economy is needed. In this regard, the figure bellow presents the real GDP per capita developments from 2002 to 2016 (Eurostat only provides data for this indicator since 2000, but as data for Romania is only available since 2002, I decided to use this starting point).

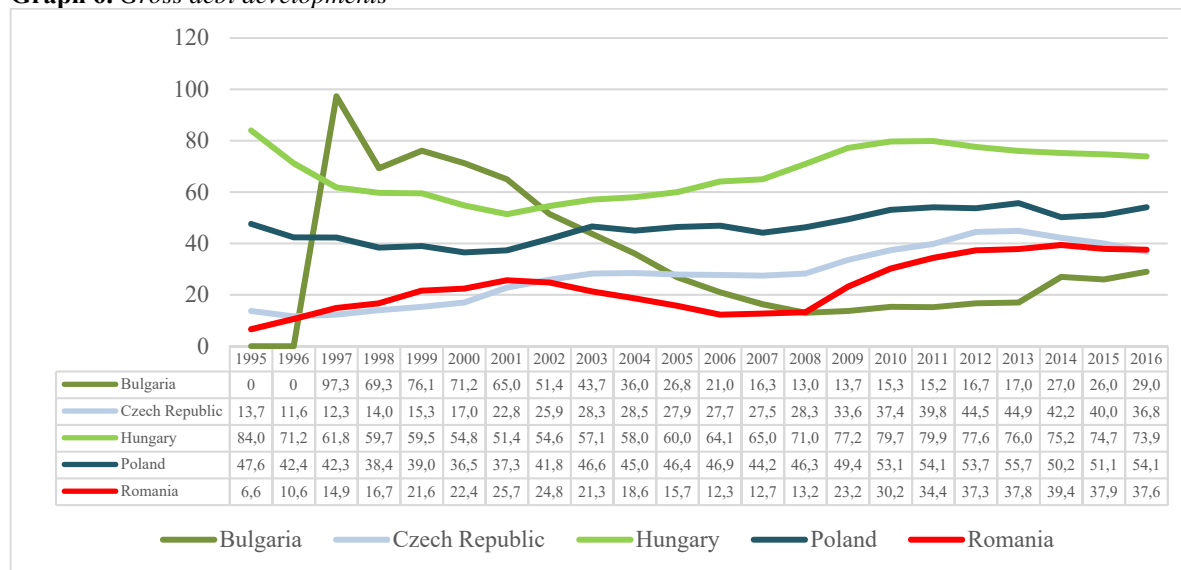
**Graph 5.** *Real GDP per capita (chain linked volumes 2010)*



**Source:** Eurostat database.

We can easily notice that the best performer is by far Czech Republic, followed by Hungary and Poland. Romania and Bulgaria are at the end of the ranking. It worth mentioning that Poland was the only one with continuous increase in its GDP per capita (the other 4 saw the impact of the crisis and the value of this indicator decreased) and almost reached Hungary, even if at the beginning there was a significant difference in favor of this last one. Still, the differences between these 5 member states are significant: in 2016, Romania and Bulgaria had a GDP/capita of less than 50% of that of Czech Republic (46%, respectively 36%)m, while the other two were at almost 70%.

Having in mind that Romania and Bulgaria started from the lowest level, during 2002-2016, they saw the biggest increase of their GDP per capita: 79%, respectively 76%, followed by Poland with 67% (Czech Republic and Hungary had an increase of less than 40%). If we are to measure in nominal terms, the ranking is switching, of course.

**Graph 6. Gross debt developments**

**Source:** Eurostat database. For Bulgaria, data is not available for 1995 and 1996, so the value in the table is 0 for both years.

As regards the debt developments from 1995 to 2016, the picture is mixed. Hungary started with a high debt, that was on a decreasing path up to 2001, when it started increasing significantly, remaining above the Treaty reference of 60% of GDP. The Czech Republic also started with a high public debt, but this was considerably reduced. Generally, except these two outliers, the public debt did not have great values.

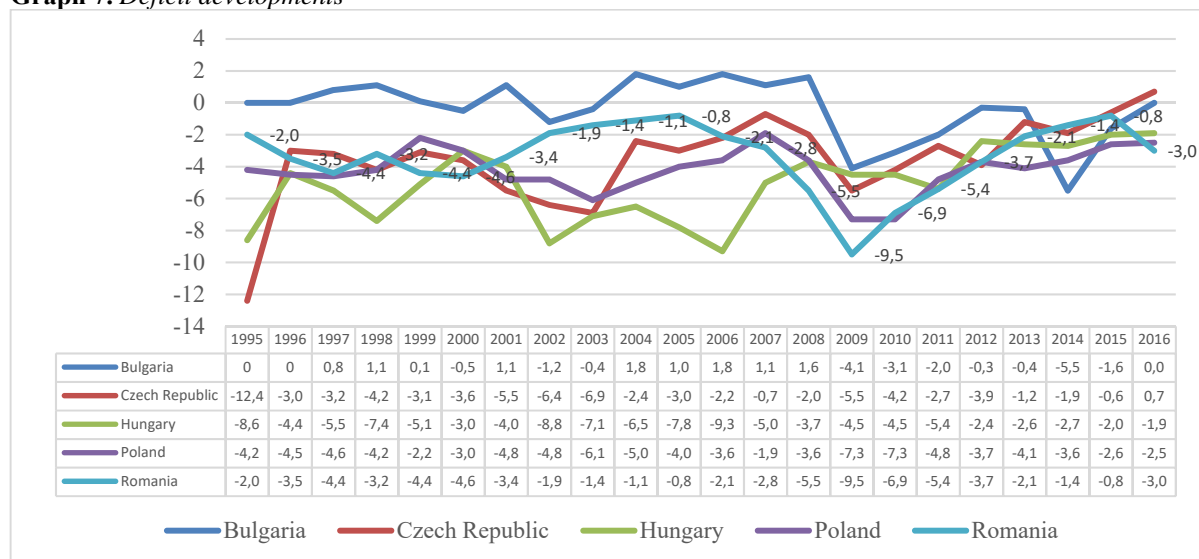
Coming back to Romania, 2001 to 2007 brought reduced rates of public debt, that started increasing after 2008 (and the rise did not stop yet). I would recall that 1999 was the year when the accession negotiations started, so this looked to have some influence on the fiscal conduct. The financial crisis brought a reverse in the trend, but still the level is significantly under the reference value of 60% of GDP.

It is interesting to have a look at the average debt: Hungary would be first, with 67.6% of GDP, Poland 2nd with 46.5 of GDP, Bulgaria the 3rd with 37.4% of GDP, Czech Republic the 4th, with 28.2% of GDP and Romania last, with 23.4% of GDP.

As regards the deficit developments, Graph 7 shows even greater differences between member states that in the case of debt, but if we are to look at the average, Hungary still keeps the first place (-5.1% of GDP), followed by Poland (again the 2nd with -4.2% of GDP), Czech Republic (-3.5% of GDP), Romania (-3.4% of GDP) and Bulgaria (-0.45% of GDP).

All the member states were strongly hit by the crisis, when the budget deficit peaked, followed by adjustments.



**Graph 7. Deficit developments**

**Source:** Eurostat database. For Bulgaria, data is not available for 1995 and 1996, so the value in the table is 0 for both years.

In case of Romania, if we are to exclude Bulgaria, had the best performances compared with the other states in the sample during 2000-2007. Afterwards, it started to move, it became a worst performer and was the most effected when the crisis hit. Significant adjustments took place from 2010-2015, but 2016 almost brought the launch of the excessive deficit procedure. It should also be observed that in 2008, a year when Romania was not in program with the IMF and when the Stability and Growth Pact did not have the weight it has today, Romania had a great slippage in terms of budget deficit.

## Conclusions

Compared with the other countries in the sample (Hungary, Poland, Czech Republic, Bulgaria), Romania had the strongest relations with the IFM and the EU, through the programs that were attached to financial support (10 with the IMF and 3 with the European Commission). Strict conditions were imposed, and these went deep into the policy making process and fiscal conduct (budgetary drafting and execution, taxation system, debt management, state owned enterprises). Indeed, it must be mentioned that not all the programs were closed (as the latest preventive program from 2013 to 2015) and not all the conditions attached were fulfilled, but of course the direct impact can be seen at least in terms of general orientation of the public policies.

In the same time, Romania benefited of the greatest amount in financial support compared with the other four countries.

In terms of economic growth, all five countries followed a similar path – a clear growth trend, the difference being mainly in the growth rate and of course the starting point plays its merits in today's outlook.

In terms of deficit and debt, Romania had good performances on average, being on top (first as regards the debt and second as regards the budget deficit), this strictly from the point of view of fiscal discipline measured according to the Maastricht Treaty, so we can see more discipline, but having in mind the path of the economic growth and the real GDP per capita developments, it seems that this discipline was important (if we are to look at the growth rate), but not the only factor for the real economy to develop (if we assess the nominal rate and the other 4 states as well).

If we are to compare the influence of the two institutions, of course the rank changed after 2000 (and more after 20017 after accession), the EU influence being stronger and on a

permanent basis (the Maastricht criteria, the Stability and Growth Pact, the European Semester) and it will become even greater after adopting the Euro (the Euro Area member states have more stringent rules when it comes to fiscal conduct). The IMF direct involvement is seen during the programs only.

Last, but not least, we should mention that Poland, the second after Romania in terms of closeness to the 2 institutions (measured in numbers of years covered by programs), had the best economic performances: constant increase in its GDP per capita, keeping the public debt relatively constant and using the budget deficit to counter balance the crisis effects and reducing it on a more moderate path compared to Romania (where we can notice more changes to the trend in all these indicators, that indicates the importance of the continuity in implementing policies).

---

## References

---

- Balaceanu, C. and Apostol, D., 2012. The Impact of IMF' Macroeconomic Policies in Romanian Economy in Economic Crisis Context, *International Journal of Academic Research in Economics and Management Sciences*, January 2012, Vol. 1, No.1.
- Communication from the Commission to the European Parliament, the Council, the European Central Bank, the Economic and Social Committee, the Committee of the Regions and the European Investment Bank Making the Best Use of the Flexibility within the Existing Rules of the Stability and Growth Pact.
- Council Regulation (EC) No 1467/97 of 7 July 1997 on speeding up and clarifying the implementation of the excessive deficit procedure.
- Council Regulation (EC) No 1466/97 of 7 July 1997 on the strengthening of the surveillance of budgetary positions and the surveillance and coordination of economic policies.
- Council Decision 2009/459/EC of 6/5/2009 providing Community medium-term financial assistance for Romania.
- Council Decision 2011/288/EU of 12/5/2011 providing precautionary EU medium-term financial assistance for Romania.
- Council Directive 85/2011 on requirements for budgetary frameworks of the Member States.
- Council Decision 2013/531/EU of 22 October 2013 providing precautionary Union medium-term financial assistance to Romania.
- Country Specific Recommendations for Romania for 2011, 2012, 2013, 2014, 2015, 2016 and 2017, <[https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/european-semester/european-semester-timeline/eu-country-specific-recommendations\\_en](https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/european-semester/european-semester-timeline/eu-country-specific-recommendations_en)>
- European Semester: Annual Growth Survey for 2011, 2012, 2013, 2014, 2015, 2016, 2017 and 2018, <[https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/european-semester/european-semester-timeline/setting-priorities\\_en](https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/european-semester/european-semester-timeline/setting-priorities_en)>
- Eurostat database, [online], <<http://ec.europa.eu/eurostat>>
- Fresnillo, I., 2012. Progress on IMF Conditionality?, <<http://eurodad.org/files/pdf/528e3326ba624.pdf>>
- Imam, P.A., 2007. Effect of IMF Structural Adjustment Programs on Expectations: The Case of Transition Economies, <<https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Effect-of-IMF-Structural-Adjustment-Programs-on-Expectations-The-Case-of-Transition-Economies-21449>>
- IMF MONA database, [online], available at <<https://www.imf.org/external/np/pdr/mona/index.aspx>>
- 2011 European Semester: Annual Growth Survey. <[https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/european-semester/european-semester-timeline/setting-priorities\\_en](https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/european-semester/european-semester-timeline/setting-priorities_en)>
- Jeloica, S., 2017. Twenty years of Stability and Growth Pact, *Review of Finance and Banking*, Vol. 9, Issues 1.
- Lamndany, R. and Hamann, A.J., 2007. Structural Conditionality of IMF Supported Programs, *IMF Independent Evaluation Office*, <[http://www.ieo-imf.org/ieo/files/completedevaluations/01032008SC\\_main\\_report.pdf](http://www.ieo-imf.org/ieo/files/completedevaluations/01032008SC_main_report.pdf)>
- Voinescu I.V., 2018. Fiscal Multipliers in Romania, presentation at the FIBA 2018 international conference Treaty on Stability, Coordination and Economic Governance within the Economic and Monetary Union, <[https://www.consilium.europa.eu/media/20399/st00tscg26\\_en12.pdf](https://www.consilium.europa.eu/media/20399/st00tscg26_en12.pdf)>

# Impact of the Volatility of Indian oil prices on sectoral returns in Indian Equity Markets

**Dr. Rinku JAIN\***

rinkujain@somaiya.edu / jainrinku5@gmail.com

**Dr. Kirti AREKAR\*\***

**Aayesha TAHERAH\*\*\***

**Abstract.** *The stock market of any country indicates the health of a country. It also indicates the confidence of the population of the country in its economy. India, being an emerging country, has exhibited a substantial rate of growth over past years. One of the parameters that determine the growth rate and health of the economy of a nation is its stock market.*

*The aim of this research is to find the volatility in the global oil price, its impact on various sectoral indices listed on the Indian Stock Exchange. BSE SENSEX and other sectoral Indices listed on the Bombay Stock Exchange (BSE) such as BSE Realty, BSE Power, BSE Oil and Gas, BSE Metal, BSE Consumer Durables, BSE Capital Goods, BSE BANKEX, BSE AUTO, BSE Utilities, BSE telecom, BSE Information Technology, BSE Industrials, BSE Finance, BSE Fast Moving Consumer Goods, BSE Energy, BSE Basic Materials are considered to determine the impact of fluctuation of oil price in the stocks of various sectors. The index BSE SENSEX has been considered to determine the performance of the Indian Equity market with respect to the oil price fluctuations. Log normal of the daily closing prices of each of the stock indices and the oil prices have been considered to carry out the research. Techniques such as unit root test, Jarque beta test, correlation test, Granger Causality test, Impulse response and Vector decomposition test have been applied on the closing prices of indices between 1st April, 2010 to 31st December 2017 (1st Financial quarter of the year 2010, in India to the 3rd Financial quarter of the year 2017).*

*The tests show that the average stock returns for the sectors Auto, Bankex, Basic Materials, Capital Goods, Energy, Finance, FMCG, IT, Oil and Gas, Sensex, Industrials is positive whereas for others sectors, average return is negative. Although oil is one of the largest consumers of oil in the world, its stock market returns does not depend on the fluctuation in the oil prices.*

**Keywords:** Indian Oil Price Volatility, Impulse Response, Vector Decomposition.

**JEL Classification:** G29.

## 1. Introduction

Oil is the one of the most important sources of energy and contributes to around one-third of the global energy consumption. According to BP Statistics 2017, India has become the largest contributor to incremental oil consumption surpassing China, increasing by 325 kb/d in the year 2016. India was the third largest oil consumer in the world (4.6% of the total), in the year 2016.

India is 6<sup>th</sup> largest consumer of oil in the world. It has been estimated by BP Statistical Review of World Statistics that India's Oil consumption growth will be the fastest among all the major economies by the year 2035. Also, India's energy demand growth is at 129%, which is much higher than the demand growth of any of the BRICS countries. India's share of global energy demand will increase to 9% by the year 2035, says the review.

Since India imports 76% of its crude oil requirements and most of the industries have crude oil as their raw material, there is a direct impact of the oil price variations on the Indian Economy. It is found that crude oil prices have a positive impact on inflation (whole sale price index) in India (Bhattacharjee, 2013).

Whenever there is an increase in the global oil prices, it creates a burden on the Indian economy as the state exchequer has to pay more for the imports in terms of the dollar. The current account deficit (CAD) increases and the exchange rate increases. Indian rupee starts depreciating and margins of oil companies start reducing.

On the other hand, when there is a decrease in the oil prices, the imports become less expensive, the current account deficit (CAD) decreases, rupee appreciates and the margins of oil and other companies using oil as the raw material increases. Hence, the economy of the country improves.

It is found over the years that variation in the oil prices has an impact on performance of the stock markets too. Change in the crude oil price is often considered an important factor for understanding the changes in the stock prices. Oil price volatility affects stock markets returns or prices through their effect on expected earnings, as concluded by (Jones & Kaul, 1996).

Over a period of time it has been observed that the variation in oil prices has led to variation in prices of the stocks belonging to various sectors. Some of the sectors that get impacted the most are refiners and oil marketing companies, upstream oil companies, automobile etc. However, gas and oil companies represent only 1.4% of the Indian Stock Market. India being an oil importing country, any variation in oil prices causes a change in the stock market indices.

India is an emerging country and any variation in the macroeconomic parameters or the markets of the country affect the global economy, directly or indirectly. India is a growing economy and a parameter like oil price will definitely have its impact on its growth.

The economic growth of a country and the returns on investment are the key drivers for the investors to invest in a country's stock market. Volatility of oil prices being a matter of concern across the globe from a long period of time, it is essential to study the effect of fluctuations in oil prices on the sectoral indices in Indian Stock Markets. This research will help investors to get a broad outlook of the dependence of the stock market returns on oil prices changes. Further, the correlation between sectoral returns and oil prices will help investors take calculated decisions in investing in a particular sector. In order to determine the volatility of global oil price, its impact on Indian Stock Market returns and various sectoral index returns we would be using the Descriptive Statistics, Jarque-Bera test, Unit root test, Granger-Causality test, Impulse Response and Vector decomposition Models techniques.

## 2. Literature review

Many researchers in the past have tried to find the relationship between changes in oil prices and the Indian Stock Markets. The Fluctuations in the oil prices has not impacted the price creation process in Indian Stock Markets, says Chittedi. K. R through his research paper. (Chittedi, 2012). He also concludes that India's aggressive growth economy has led the Indian stock markets to impact the oil price volatility. India's economy was strong enough to bear the financial recession of 2008 with a minimal slowdown.

After the 2008 financial crisis, the degree of relationship among various macroeconomic variables, crude oil prices and asset prices has become the active topic of economic research around the globe. For an oil importing country like India, its GDP growth may depend on the oil price fluctuations. The paper by Dr. Bhunia A. (Bhunia, 2012) concludes that the GDP growth of Indian Economy is significantly affected by growth rate of stock price indexed by GDP, growth rate of oil price indexed by GDP and Exchange Rate. He applied the error correction test, co-integration and unit root tests on the data available from August 1991 to July 2011 to conclude the same.

An investment decision of an investor depends on the factors that influence the stock market of a country. It was found that the major factors affecting the stock market in India are FII (Foreign Institutional Investments), GDP growth, political stability, Inflation and global level factors such as oil prices, sub-prime crisis, etc. (Alam, 2016)

The investor sentiments depend on the performance of the economy of a country. It is essential to note the changes in the economic parameters of the country with respect to the changes in the oil prices. Considering that oil prices volatility will have an impact on the exchange rate in India, Mishra S., Debashish S. S., (Mishra & Debashish, 2016), have published a research paper titled *Analysis of Volatility Spill over between Oil Price and Exchange Rate in India: GARCH Approach*. The study reveals that an increase in oil price return leads to depreciation of exchange rate of Indian Rupee against U.S Dollar.

It is found that inflation rate acts as a chief economic variable to be highly influenced by changes in crude oil prices. With the fall in the crude oil prices over the last decade, the inflation rate also has been on a decline. India being a major oil importing country can reap benefits out of the direct relationship between the crude oil prices and the inflation rate in the country. The decrease in the inflation rate can lead to increase in the GDP of the country and hence the increase the returns from the investments in the country. (Rangan, 2016)

Another study conducted by Najaf & Najaf (R & K, 2016) using the multiple regression method concludes that there exists a positive relationship between crude oil prices and stock exchange. Due to the increase in oil prices, the cost of transportation increases, contributing to inflation in the country.

The results related to returns spillover conducted by Kumar Manish (Kumar, 2014) suggest that crude oil affects both Nifty and USD/INR exchange rates. The results also show that there is no impact of Nifty or USD/INR on crude oil prices in India. But the insignificant long run relationship implies that in the Indian Economy, the three variables share no common movements and hence, would tend to move apart in the long run. It strongly suggests that the absence of co-integration between crude oil, Nifty and USD/INR exchange rates allows the investor to consider them to be separate markets to have a diversified portfolio for investment.

Even though, oil and gas companies constitute only about 1.4% of the entire stock market in India, various newspaper articles have reported a negative impact of the rise in the oil prices on the stock market indices. One such research paper by Sriram. M (Sriram, 2015) on impulse response function indicates that there is a significant and higher response of BSE SENSEX to a shock in crude oil price. Also, the short-term causality test conducted between the crude oil and BSE SENSEX revealed that there exists a one-way causality from crude oil price to BSE SENSEX.

Another study conducted by (Maheswaran & Kumar, 2013), using the bivariate generalized autoregressive conditional heteroskedasticity model suggests that there exists a volatility spill over between the crude oil market and Indian Industrial sectors.

Bandhopadhyay. K, Mondal. D. & Sahu T. N (2013) (Bandhopadhyay, Mondal, & Sahu, 2014) conclude that there exists a positive long run relationship between the oil prices and the movement of stock market indices, though the prices of crude oil have no significant causal effect on the Indian Stock Market.

Rai & Bairagi (Bairagi & Rai, 2014), mention that there exists a relationship between oil prices and BSE Sensex. However, the degree of relationship varies from markets to markets and different time periods.

Dr. Kapil Jain (Jain, 2013), using the correlation and regression analysis on the data from 2007 to 2013, also conclude that there exists a positive correlation between the crude oil prices and the National Stock Exchange (NSE). The author also mentions that the increase in crude oil prices in the period has led to the increase in stock exchange index (NIFTY).

D. Aparna (D, 2013), says that there exists a positive relationship between crude oil and Stock Market Indices, when analyzed using bivariate and co-efficient of correlation methods. She also concludes that there exists a positive impact on Sensex, Nifty and oil and gas indices with the rise in oil prices.

Among various papers that suggested a positive correlation between the oil prices and stock markets, Siddiqui & Seth (Siddiqui & Seth, 2015), using Pearson's correlation test, suggest that, a very weak correlation exists between the stock index and the global oil price changes. Also, from the Johansen's co-integration test, it was found that there is no long-term integration between the stock index and the oil series

While there have been studies conducted on impact of the oil price volatility on Indian stock markets and its economic indicators, there have been studies conducted on impact of oil prices on stock markets and economic indicators of various other countries. One such study on 15 OECD countries was conducted by Liao, Chen & Huang (Liao, Cheng, & Huang, 2015) in the year 2015, using the Hamilton-Markov switching model and the multifactor market model on the data available from the year 1970:Q2 to 2008:Q3. They found that, when the stock market is exhibiting a bull trend, a rise in the oil price will not affect stock returns in 15 OECD countries, but a reduction in oil price will increase the stock returns in seven OECD countries. They concluded that regardless of oil price shocks, long term investors can earn different levels of income or returns when the stock market is exhibiting a bull trend.

The emerging economies, collectively known as Brazil, Russia, India, China and South Africa (BRICS), have grown rapidly and contribute to around 22% of the world gross domestic product (GDP). However, these 5 countries differ in terms of the oil characteristics. Brazil and Russia are one of the largest producers and exporters of oil and have a considerable amount of representation by the oil and gas companies on their respective stock exchanges. India and China are the largest consumers of oil. Oil and gas companies constitute only about 1.4%, 4% and 16% of the entire stock market in India, South Africa and China respectively. With the above representations, it was found by Granger Causality test that there exists the causality from oil prices to stock markets in Russia and Brazil could be seen in long run (lower frequencies). China exhibits medium-term causality, whereas India and South Africa exhibit short run causality. (Bouoiyour & Selmi, 2016)

Sehgal S & Kapur R (Sehgal & Kapur, 2012), in their article, have considered 15 countries in their sample for examining the relationship between oil price shocks and stock market behavior. They further classified the sample countries into 4 categories based on economic strength and oil exporting/importing status. They found that sample countries such as US, India, South Korea and Indonesia provide significantly positive returns in response to negative oil price shocks.

The impact of oil price uncertainty on stock market returns was further studied by Maghyereh A. & Amartani B. (Maghyereh & Amartani, 2016) on the ten oil exporting and importing countries in Middle East and North African Region (MENA region). They found using the GARCH model that, there is a negative and significant relationship between the oil price uncertainty and real stock returns in all the countries in the sample.

The short term and long term linkages between the oil prices and the stock markets in the Gold Cost Countries (GCC), which are major energy players in the world, was investigated by authors (Arouri, Bellalah, & Nguyen, 2011). They found that a strong positive linkage exists between oil price variations and the stock markets in almost all the countries under study. There was no linkage observed between the oil price fluctuations and stock markets in long term analysis, carried out.

Similar such study on the frontier markets was conducted by (Gomes & Chaibi, 2014). They found that the spill-over effect between the oil price fluctuations and the returns of the frontier equity markets is bidirectional. The results were obtained by using the GARCH model on stock market data representing 23 frontier equity markets and two broad equity indices (MSCI world and MSCI Frontier Markets). This is in contrast with the results obtained with respect to the developed countries where the spill-over effect is unidirectional (i.e. from the oil price volatility to the stock market returns)

Further, the impact on the market characteristics due to the oil price volatility was studied in a developed market like US (Mohanty, Akhigbe, Al-Khyal, & Bugshan, 2013). It is observed that the Oil and gas firm returns, market betas, return variances and trading volumes respond asymmetrically to the changes in the oil prices. Hence, there will be certain sectors which get severely impacted by the changes in the oil prices.

Another such study by Ahmed & Wadud (Wadud & Ahmed, Oil Price Volatility and Sectoral Returns uncertainties : Evidence from a Threshold Based Approach For the Australian Equity Market, 2017) on one of the largest oil exporting countries like Australia suggests that financial and industrial sectors respond faster to the changes in oil prices than other sectors. They found a negative relationship between oil return volatility and equity uncertainty for all sectors except for consumer discretion and consumer staples sectors.

On the contrary, Similar study (Wadud & Ahmed, Oil Price Volatility, Investment and Sectoral Responses: The Thai Experience, 2016) conducted on oil importing countries such as Thailand suggests that oil price volatility has an adverse impact on real investment in the country. The study also reveals that, investments in textiles, wood and furniture, and machineries and equipment industries falls significantly in response to the increase in oil price volatility, in such countries.

Ramos & Veiga (Ramos & Veiga, 2010) in their study on oil price fluctuations on international stock markets, analyzed 43 stock markets from 1988-2009. They found that stock markets of developing countries exhibit different behavior when compared to the stock markets of emerging countries with respect to the variations in oil prices. The stock markets of developing countries soar when oil prices fall, however they do not necessarily rise when oil prices fall. Whereas, emerging country markets do not show significant change in returns with respect to oil price changes, is what they conclude.

Objectives of the study are:

1. To determine the volatility in Oil Prices over a period of 7 years from 2011: to 2017:
2. To establish a relationship between the oil price variations and the stock markets in India
3. To examine the impact of oil price volatility on various sectoral indices
4. To understand the impulse responses in the Indian stock markets with the one standard changes in the oil prices.

### 3. Data and methodology

Data under consideration is the daily closing prices of various stock market indices listed on the Bombay Stock Exchange from 1<sup>st</sup> Indian Financial quarter of the year 2010 (1<sup>st</sup> April 2010) to 3<sup>rd</sup> Indian Financial quarter of the year 2017 (31<sup>st</sup> December 2017). The reference oil prices are the per barrel prices of the West Texas Intermediate (WTI) from 1<sup>st</sup> April 2010 to 31<sup>st</sup> December 2017 (considered to match the Indian Financial quarters). The oil prices in USD were converted to INR at the daily USDINR rates mentioned between the same periods. A total of 1594 observations have been considered for each of the data under study. The daily closing prices have been converted to index return series by using natural logarithm.

**Table 1.** *The indices considered are:*

BSE Sectors	Sample Size
S&P BSE SENSEX	1594
S&P BSE AUTO	1594
S&P BSE BANKEX	1594
S&P BSE Basic Materials	1594
S&P BSE Consumer Durables	1594
S&P BSE Capital Goods	1594
S&P BSE CPSE	1594
S&P BSE Energy	1594
S&P BSE Finance	1594
S&P BSE Fast Moving Consumer Goods	1594
S&P BSE Industrials	1594
S&P BSE Information Technology	1594
S&P BSE METAL	1594
S&P BSE OIL&GAS	1594
S&P BSE POWER	1594
S&P BSE PSU	1594
S&P BSE REALTY	1594
S&P BSE UTILITIES	1594
S&P BSE Telecom	1594

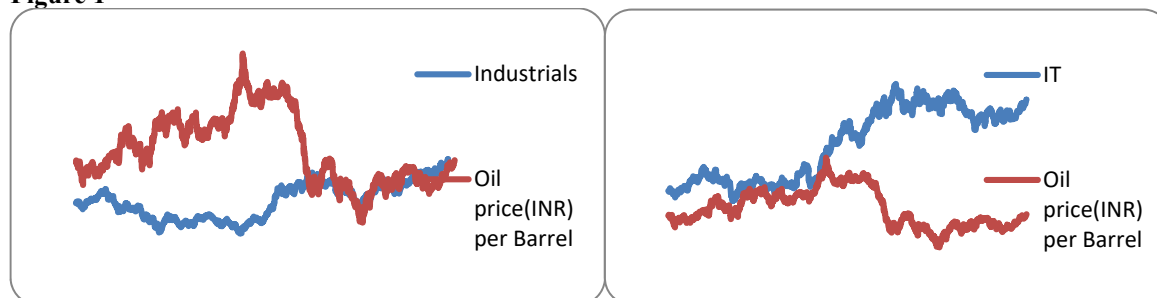
S&P BSE SENSEX measures the overall performance of the stock exchange. Other indices are the sectoral indices. They measure the performance of the companies under particular sectors

Descriptive Statistics, Jarque-Bera test, Unit root test, Granger-Causality test, Impulse Response and Vector decomposition Models have been used to understand the impact of Indian oil price volatility on the Bombay Stock Exchange (BSE) indices such as, Industrials, IT, Metals, O&G, Power, PSU, Realty, Auto, Bankex, Basic Materials, Energy, Capital Goods, Consumer Durables, CPSE, Finance, FMCG, Sensex, Telecom, and Utilities returns.

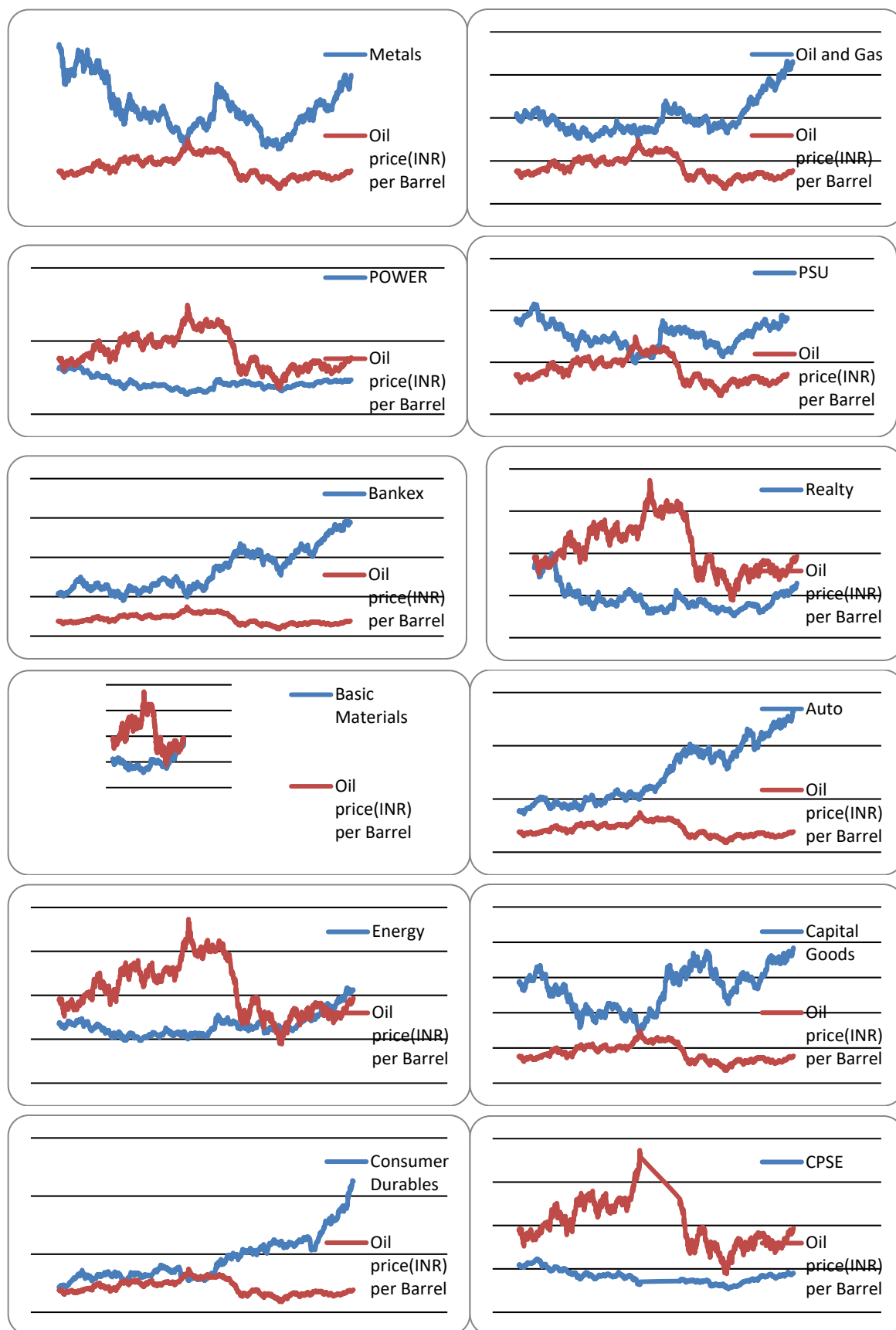
### 4. Findings

#### 4.1. Volatility fluctuation

**Figure 1**







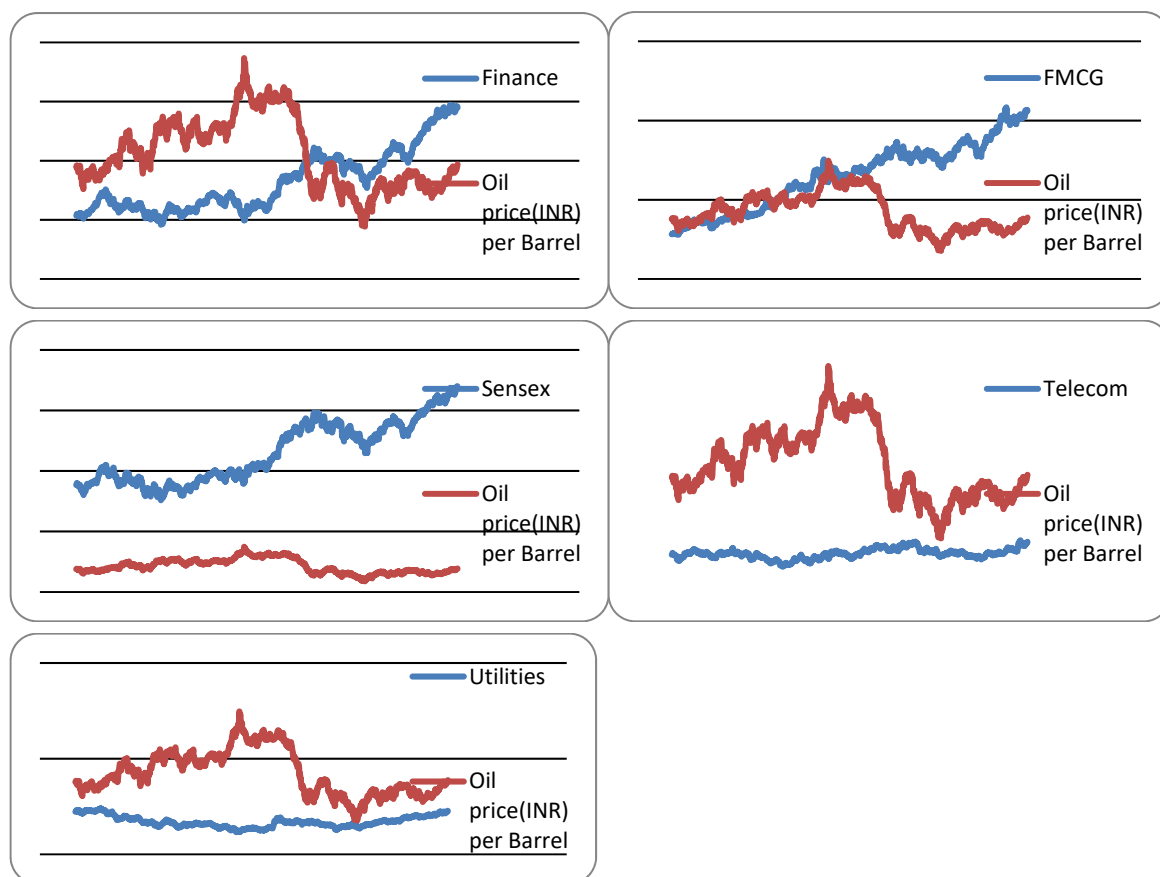


Figure 1 explains that the volatility of the sectoral indices Metals, Oil and Gas, Private sectors, Auto, Banking, Capital Goods, Consumer Durables and Sensex have the high volatility with respect to Indian oil price volatility. The other markets have the low returns as compared to Indian oil price stock market.

#### 4.2. Descriptive statistics

Table 2. Descriptive statistics

	AUTO	BANKEX	BASIC_MATERIALS	CAPITAL_GOODS	CONSUMER_DURABLES	CPSE	ENERGY	FINANCE	FMCG
Mean	0.060065	0.042427	0.004176	0.060408	-0.000994	-0.01	0.0045	0.04164	0.065975
Median	0.090918	0.02549	0.032059	0.102479	-0.011889	0.028	-0.0278	0.048306	0.108458
Maximum	5.886802	8.896773	4.930392	7.35419	8.417398	3.838	5.46373	7.233316	5.167169
Minimum	-7.46232	-7.24471	-7.865146	-8.756482	-7.349534	-7.72	-8.6108	-7.07597	-6.08834
Std. Dev.	1.290409	1.55049	1.387174	1.503803	1.56689	1.089	1.30499	1.417701	1.07723
Skewness	-0.09501	0.065383	-0.305724	-0.248836	0.026636	-0.44	-0.2091	-0.08998	-0.22015
Kurtosis	4.645934	4.62256	4.185671	6.159815	4.701042	5.41	4.61418	4.467036	5.446645
Jarque-Bera	182.3275	175.9909	118.2007	679.5826	192.368	436.5	184.667	145.0924	410.4504
Probability	0	0	0	0	0	0	0	0	0
Sum	95.74345	67.62943	6.655799	96.29088	-1.584862	-18.7	7.17991	66.37383	105.164
Sum Sq. Dev.	2652.593	3829.605	3065.335	3602.447	3911.044	1888	2712.89	3201.733	1848.555
Observations	1594	1594	1594	1594	1594	1594	1594	1594	1594

	IT	METAL	Oil and Gas	OIL_PRICE	POWER	PSU	REALTY	SENSEX	TELECOM	UTILITIES	INDUSTRIALS
Mean	0.01774	-0.035	0.009212	-0.019896	-0.02781	-0.012	-0.0602	0.0255	-0.00273	-0.01501	0.038093
Median	0.08938	-7E-04	-0.011726	-0.029114	0.028207	0.0063	0.01486	0.0265	-0.06684	0.00554	0.032031
Maximum	5.60124	7.9055	5.124823	12.1841	9.667595	8.6188	7.68839	3.7034	7.089826	8.18429	8.928543
Minimum	-8.0137	-7.455	-9.655576	-11.13384	-8.46592	-8.196	-11.573	-6.1197	-6.72948	-8.11339	-11.75858
Std. Dev.	1.36206	1.707	1.31947	2.241338	1.348462	1.244	2.17721	1.0517	1.668251	1.24797	1.342552
Skewness	-0.2079	0.06	-0.251348	0.237998	-0.30214	-0.12	-0.2906	-0.1429	0.160485	-0.33631	-0.620911
Kurtosis	4.29056	4.101	5.190755	6.061827	6.472933	6.2032	4.56266	4.3633	4.2653	6.11971	10.79039
Jarque-Bera	122.103	81.466	335.5443	637.6899	825.3208	685.31	184.621	128.87	113.1744	676.452	4133.258
Probability	0	0	0	0	0	0	0	0	0	0	0
Sum	28.2752	-55.31	14.68354	-31.7145	-44.3207	-18.41	-95.984	40.626	-4.35181	-23.9304	60.71965
Sum Sq. Dev.	2955.34	4641.6	2773.417	8002.591	2896.632	2465.3	7551.2	1762.1	4433.419	2480.99	2871.298
Observations	1594	1594	1594	1594	1594	1594	1594	1594	1594	1594	1594

From the Table 2, we can observe that the average stock returns for the sectors Auto, Bankex, Basic Materials, Capital Goods, Energy, Finance, FMCG, IT, Oil and Gas, Sensex, Industrials is positive whereas for others sectors, average return is negative. Average return is maximum for the sectors, Auto, Capital Goods and FMCG. The returns of the sector Realty has the maximum standard deviation i.e. 2.177 and the sector Sensex has the minimum standard deviation i.e. 1.05. Jarque-Bera test is being conducted to check if the data taken is normally distributed. It explains that all the return series are not normally distributed as specified the probability of Jarque-Bera test

#### 4.3. Unit root test

**Table 3.** Unit root test of Stationary by ADF test Statistics

Items	At Zero label			At first order difference		
	Lag Length	ADF Statistics	p-value	Lag Length	ADF Statistics	p-value
Oil price per barrel	1	-1.698743	0.7518	0	-48.36583	0
S&P BSE SENSEX	1	-2.344995	0.4087	0	-40.25382	0
S&P BSE AUTO	1	0.242995	0.9752	0	-39.60171	0
S&P BSE BANKEX	1	-0.002706	0.9572	0	-40.11431	0
S&P BSE Basic Materials	1	0.765305	0.9935	0	-39.10073	0
S&P BSE Consumer Durables	0	2.779294	1	0	-42.21315	0
S&P BSE Capital Goods	1	-0.979308	0.7625	0	-38.28711	0
S&P BSE CPSE	1	-1.816461	0.3727	0	-35.96581	0
S&P BSE Energy	0	0.465258	0.9855	0	-41.48461	0
S&P BSE Finance	1	0.337704	0.9802	0	-41.48461	0
S&P BSE Fast Moving Consumer Goods	0	-0.478355	0.8929	0	-41.62941	0
S&P BSE Industrials	1	-0.294883	0.9232	0	-38.17122	0
S&P BSE Information Technology	0	-1.016781	0.7493	0	-41.29138	0
S&P BSE METAL	0	-1.239153	0.9013	0	-40.78153	0
S&P BSE OIL&GAS	0	-0.902213	0.9542	0	-41.59238	0
S&P BSE POWER	1	-1.849515	0.6801	0	-40.04271	0
S&P BSE PSU	1	-1.685257	0.7577	0	-38.17517	0
S&P BSE REALTY	1	-1.497276	0.8306	0	-39.2633	0
S&P BSE UTILITIES	0	-1.094007	0.9284	0	-40.93655	0
S&P BSE Telecom	0	-2.761648	0.2119	0	-42.76758	0

In this test, we check if the series data is stationary or non-stationary using the Augmented-Dickey Fuller (ADF test). The test is applied to each of the data under study using the hypothesis:

$H_0$ : Series is not stationary

$H_1$ : Series is stationary

From the table 3, we find that each of the data series (19 stock indices and the oil prices data series) considered have a unit root at first difference at 1% significance level. This implies that

the null hypothesis for the presence of unit root or the series to be stationary cannot be rejected at 1% significance level.

#### 4.4: Granger-causality test

**Table 4.** *Granger Causality test results*

Null Hypothesis:	Obs	F-Statistic	Prob.
OIL_PRICES does not Granger Cause AUTO	1849	0.13925	0.87
AUTO does not Granger Cause OIL_PRICES		2.52408	0.0804
OIL_PRICES does not Granger Cause BANK	1849	0.62132	0.5373
BANK does not Granger Cause OIL_PRICES		1.18859	0.3049
OIL_PRICES does not Granger Cause BM	1849	0.7343	0.48
BM does not Granger Cause OIL_PRICES		3.51446	0.03
OIL_PRICES does not Granger Cause CD	1849	0.393	0.6751
CD does not Granger Cause OIL_PRICES		0.23076	0.794
OIL_PRICES does not Granger Cause CG	1849	0.1567	0.855
CG does not Granger Cause OIL_PRICES		2.36341	0.0944
OIL_PRICES does not Granger Cause CPSE	1592	1.28411	0.2772
CPSE does not Granger Cause OIL_PRICES		0.49562	0.6093
OIL_PRICES does not Granger Cause ENERGY	1849	0.41053	0.6634
ENERGY does not Granger Cause OIL_PRICES		1.16446	0.3123
OIL_PRICES does not Granger Cause FIN	1849	0.34673	0.707
FIN does not Granger Cause OIL_PRICES		1.13874	0.3204
OIL_PRICES does not Granger Cause FMCG	1849	0.12088	0.8862
FMCG does not Granger Cause OIL_PRICES		1.50942	0.2213
OIL_PRICES does not Granger Cause LNDUS	1917	0.51542	0.5973
LNDUS does not Granger Cause OIL_PRICES		3.95986	0.0192
OIL_PRICES does not Granger Cause METALS	1849	0.47197	0.6238
METALS does not Granger Cause OIL_PRICES		2.3918	0.0917
OIL_PRICES does not Granger Cause O_G	1849	0.63474	0.5302
O_G does not Granger Cause OIL_PRICES		0.76296	0.4664
POWER does not Granger Cause OIL_PRICES	1849	1.10801	0.3304
OIL_PRICES does not Granger Cause POWER		1.66588	0.1893
PSU does not Granger Cause OIL_PRICES	1831	0.89427	0.4091
OIL_PRICES does not Granger Cause PSU		0.46868	0.6259
REALTY does not Granger Cause OIL_PRICES	1849	2.39102	0.0918
OIL_PRICES does not Granger Cause REALTY		1.02418	0.3593
SENSEX does not Granger Cause OIL_PRICES	1849	2.43916	0.0875
OIL_PRICES does not Granger Cause SENSEX		0.16825	0.8452
TELE does not Granger Cause OIL_PRICES	1849	0.92226	0.3978
OIL_PRICES does not Granger Cause TELE		2.40297	0.0907
UTIL does not Granger Cause OIL_PRICES	1849	1.63712	0.1948
OIL_PRICES does not Granger Cause UTIL		2.10739	0.1218

The Granger causality test is conducted to find if change in one variable causes the change in another over a long term. The hypothesis for the same is as follows

$H_0$ : There is no causality between the sample series

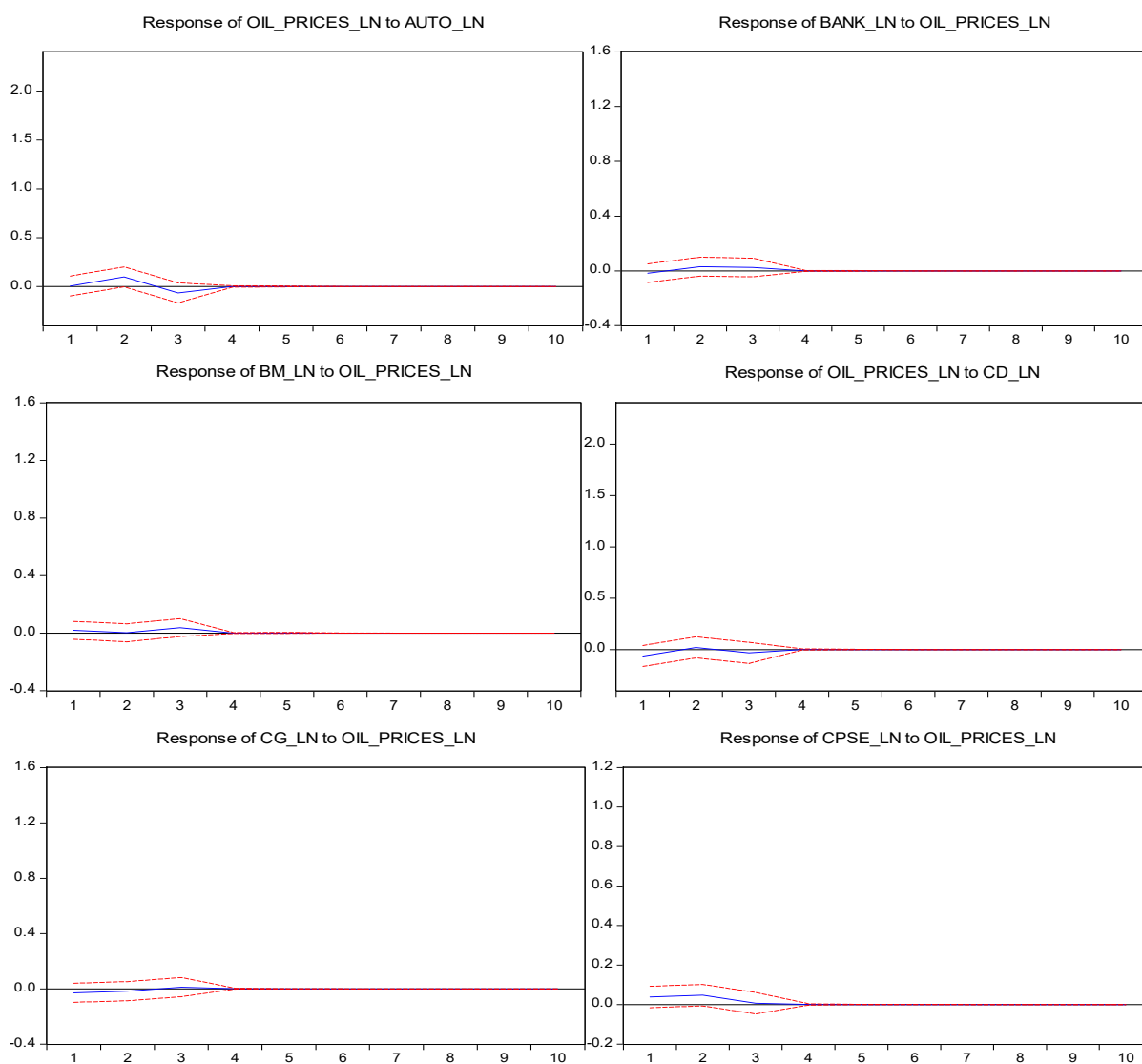
$H_1$ : There exists causality between the sample series

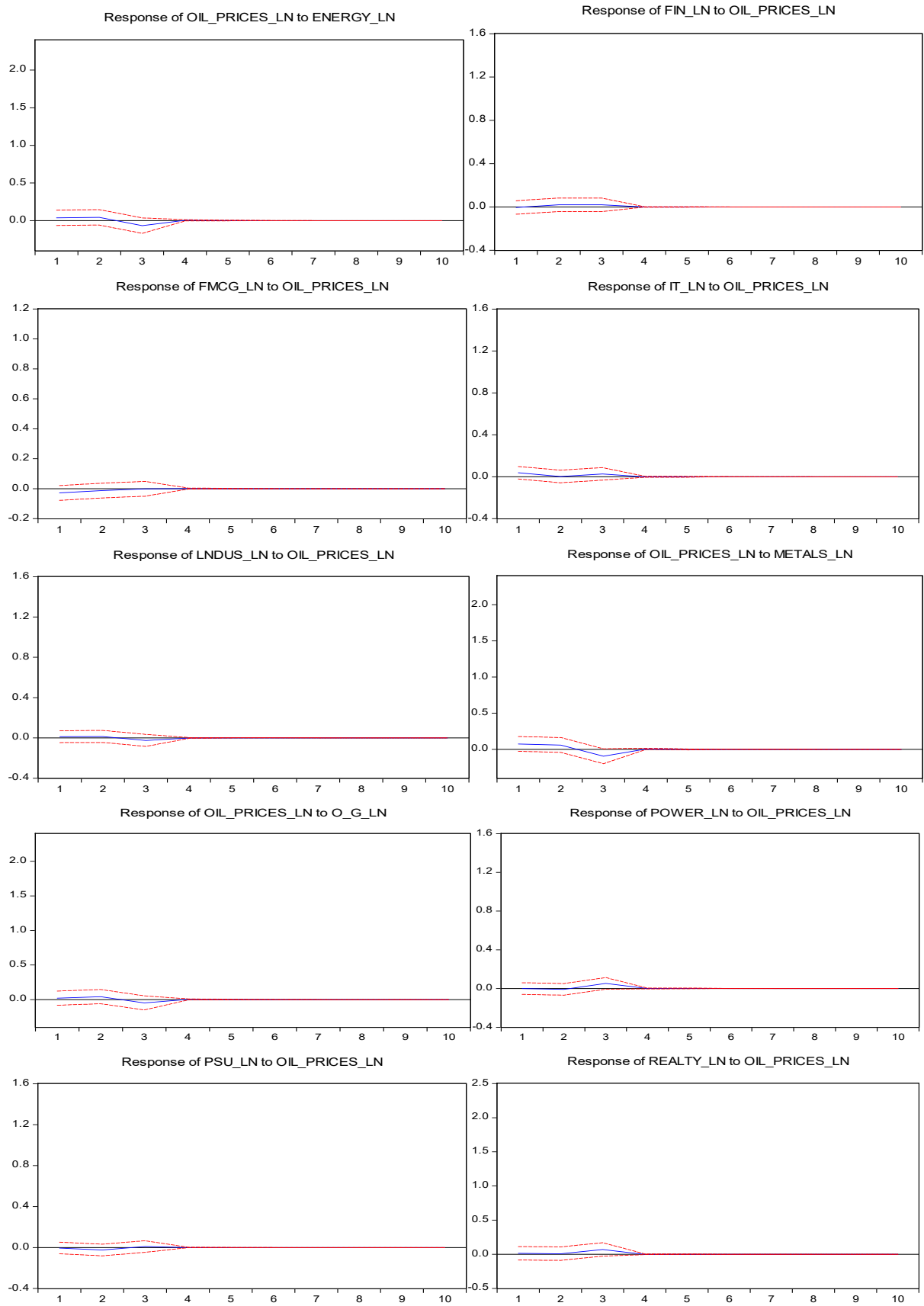
The results of the Granger Causality test can be found in table 4. From the table we can infer that the null hypothesis does not get rejected at 5% significance level. However, there is a causality observed from Basic materials index and Industrials index to oil prices, at 5% significance level.

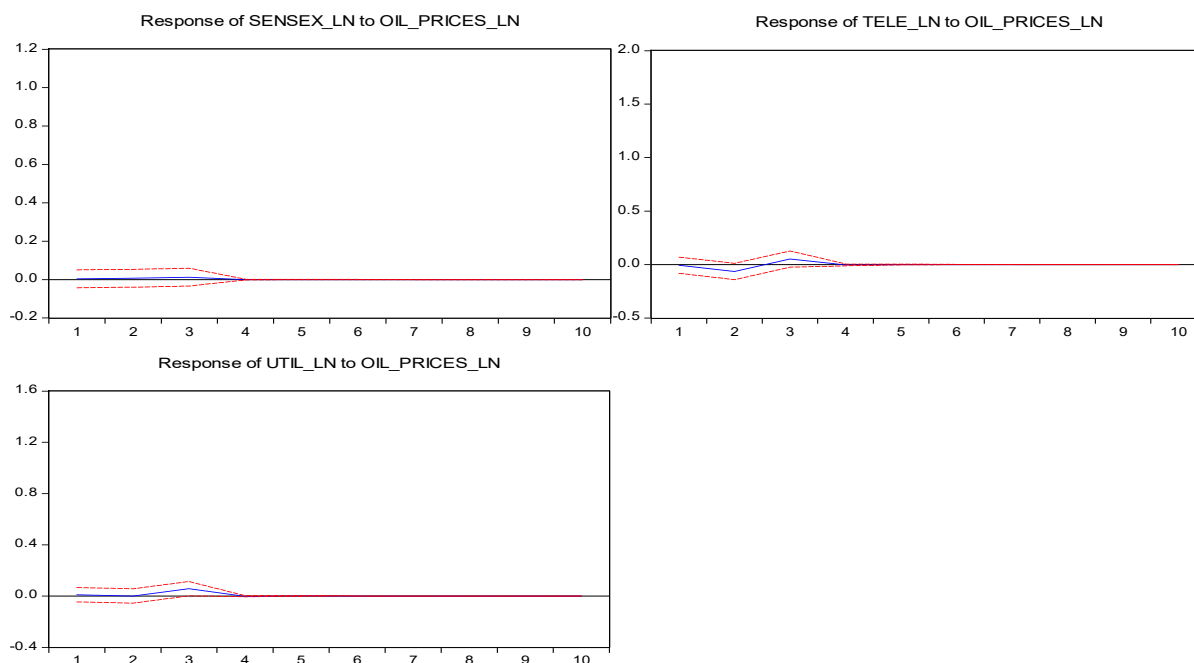
At 10% significance level, the null hypothesis for causality test between Telecom index and oil prices gets rejected. The indices- Sensex, Realty, Capital Goods, Metals and Auto show causality in the opposite direction, as assumed.

#### 4.5. Impulse response

**Figure 2**







The impulse- response function for the VAR analysis acts out the transmission of a shock to one variable in the structure on the conditional prediction of another variable. We had used the IRF analysis to understand the effects of Indian oil price volatility on the Sectorial Indices listed on the Bombay Stock Exchange (BSE) such as, Industrials, IT, Metals, O&G, Power, PSU, Realty, Auto, Bankex, Basic Materials, Energy, Capital Goods, Consumer Durables, CPSE, Finance, FMCG, Sensex, Telecom, and Utilities returns. Figure 2 represents the impulse response graphs of real stock returns of evolving from a one standard deviation shock of the Indian oil price volatility and stock returns of Sectorial Indices listed on the Bombay Stock Exchange (BSE). The Blue solid line explains the average future shock and the dotted lines are the upper and lower confidence limits in the IRF graph. If upper and lower confidence lines have the same sign, responses are statistically significant at 5% level. A one standard deviation blow to Indian oil price volatility transmitted positive response for 2 days periods in BSE Metals, 4 days periods in Banking sector and Central Public sector (CPSE), 3 days periods in Auto sector and 2 to 4 days periods in Utilities sector stock market returns. A one standard deviation blow to Indian oil price volatility transmitted negative response for 1 day period in Capital Goods, 3 days periods for Telecom and PSU sectors, and 3 to 4 days periods in Metals, Auto and Energy sectors stock market returns. There is no impact on the Industrial, IT, Oil and Gas, Realty, Consumer durables, Finance, FMCG, and Sensex sectors of the one standard deviation blow to Indian oil price volatility.

#### 4.6. Vector decomposition

**Table 5**

Period	S.E.	AUTO_LN	BANK_LN	BM_LN	CD_LN	CG_LN	CPSE_LN	ENERGY_LN	FMCG_LN	FIN_LN
1	2.231330	0.025176 (0.10608)	0.041226 (0.10248)	0.078518 (0.16236)	0.266691 (0.25837)	0.086928 (0.16851)	0.207488 (0.20649)	0.002121 (0.11955)	0.081915 (0.15758)	0.161584 (0.19357)
2	2.259352	0.250656 (0.31084)	0.050046 (0.12999)	0.102963 (0.17906)	0.282205 (0.24849)	0.085512 (0.18641)	0.245350 (0.24320)	0.005756 (0.15052)	0.161232 (0.25914)	0.161703 (0.21608)
3	2.270011	0.330960 (0.34334)	0.073081 (0.16334)	0.279782 (0.23114)	0.284435 (0.26840)	0.096087 (0.20930)	0.243508 (0.25829)	0.007422 (0.16652)	0.161774 (0.25948)	0.166182 (0.23037)
4	2.270659	0.332407 (0.34397)	0.083871 (0.16226)	0.281201 (0.23174)	0.288456 (0.27285)	0.096150 (0.20998)	0.249477 (0.25842)	0.009339 (0.16698)	0.162235 (0.25866)	0.166406 (0.22936)
5	2.270820	0.332635 (0.34430)	0.083865 (0.16316)	0.281249 (0.23256)	0.291541 (0.27442)	0.096138 (0.20988)	0.249843 (0.25836)	0.009578 (0.16651)	0.162929 (0.25843)	0.166385 (0.22954)
6	2.270831	0.332637 (0.34431)	0.083925 (0.16314)	0.281248 (0.23266)	0.291628 (0.27442)	0.096192 (0.20991)	0.249961 (0.25835)	0.009764 (0.16651)	0.162973 (0.25843)	0.166414 (0.22957)
7	2.270833	0.332663 (0.34431)	0.083938 (0.16313)	0.281247 (0.23268)	0.291639 (0.27439)	0.096206 (0.20994)	0.249960 (0.25836)	0.009769 (0.16653)	0.162996 (0.25843)	0.166419 (0.22958)
8	2.270834	0.332667 (0.34431)	0.083940 (0.16313)	0.281247 (0.23268)	0.291640 (0.27439)	0.096206 (0.20994)	0.249961 (0.25836)	0.009773 (0.16652)	0.162996 (0.25843)	0.166421 (0.22958)

Period	S.E.	AUTO_LN	BANK_LN	BM_LN	CD_LN	CG_LN	CPSE_LN	ENERGY_LN	FMCG_LN	FIN_LN
9	2.270834	0.332668 (0.34431)	0.083940 (0.16313)	0.281248 (0.23268)	0.291640 (0.27439)	0.096206 (0.20994)	0.249961 (0.25836)	0.009774 (0.16652)	0.162996 (0.25843)	0.166421 (0.22959)
10	2.270834	0.332668 (0.34431)	0.083940 (0.16313)	0.281248 (0.23268)	0.291640 (0.27439)	0.096206 (0.20994)	0.249961 (0.25836)	0.009774 (0.16652)	0.162996 (0.25843)	0.166421 (0.22959)
11	2.270834	0.332668 (0.34431)	0.083940 (0.16313)	0.281248 (0.23268)	0.291640 (0.27439)	0.096206 (0.20994)	0.249961 (0.25836)	0.009774 (0.16652)	0.162996 (0.25843)	0.166421 (0.22959)
12	2.270834	0.332668 (0.34431)	0.083940 (0.16313)	0.281248 (0.23268)	0.291640 (0.27439)	0.096206 (0.20994)	0.249961 (0.25836)	0.009774 (0.16652)	0.162996 (0.25843)	0.166421 (0.22959)

IT_LN	INDUS_LN	METALS_LN	O_G_LN	OIL_PRICES_LN	POWER_LN	PSU_LN	REALTY_LN	SENSEX_LN	TELE_LN	UTIL_LN
0.205456 (0.24559)	0.033280 (0.15501)	0.210808 (0.22564)	0.007491 (0.10123)	98.59132 (0.58056)	0.000000 (0.00000)	0.000000 (0.00000)	0.000000 (0.00000)	0.000000 (0.00000)	0.000000 (0.00000)	0.000000 (0.00000)
0.256932 (0.25165)	0.627931 (0.40350)	0.205854 (0.22186)	0.007328 (0.16604)	97.27825 (0.86162)	0.023044 (0.14519)	0.054391 (0.13028)	0.070586 (0.11318)	0.129258 (0.20111)	1.77E-06 (0.08129)	0.001001 (0.07781)
0.448760 (0.32816)	0.631129 (0.41988)	0.220291 (0.24077)	0.084910 (0.20288)	96.36835 (1.01113)	0.042483 (0.18132)	0.126887 (0.22827)	0.103347 (0.17126)	0.218429 (0.25948)	0.009618 (0.11994)	0.102566 (0.19246)
0.449520 (0.32760)	0.631144 (0.41994)	0.220878 (0.24292)	0.089414 (0.20665)	96.31333 (1.03841)	0.042759 (0.18199)	0.126831 (0.22847)	0.124422 (0.17760)	0.218929 (0.25997)	0.009684 (0.12093)	0.103547 (0.19804)
0.449488 (0.32772)	0.631076 (0.41979)	0.222000 (0.24261)	0.089650 (0.20674)	96.29983 (1.04701)	0.043443 (0.18103)	0.126913 (0.22809)	0.126228 (0.17750)	0.221264 (0.26029)	0.011412 (0.12119)	0.104534 (0.19798)
0.449534 (0.32772)	0.631164 (0.41975)	0.222032 (0.24256)	0.089650 (0.20674)	96.29893 (1.04790)	0.043501 (0.18099)	0.126913 (0.22814)	0.126235 (0.17763)	0.221268 (0.26031)	0.011495 (0.12128)	0.104536 (0.19797)
0.449537 (0.32774)	0.631174 (0.41974)	0.222045 (0.24256)	0.089651 (0.20673)	96.29871 (1.04823)	0.043506 (0.18100)	0.126920 (0.22815)	0.126235 (0.17764)	0.221277 (0.26031)	0.011574 (0.12129)	0.104537 (0.19796)
0.449537 (0.32774)	0.631173 (0.41973)	0.222045 (0.24256)	0.089651 (0.20673)	96.29868 (1.04827)	0.043510 (0.18100)	0.126921 (0.22815)	0.126237 (0.17763)	0.221277 (0.26031)	0.011575 (0.12128)	0.104539 (0.19796)
0.449538 (0.32774)	0.631174 (0.41973)	0.222045 (0.24256)	0.089651 (0.20673)	96.29868 (1.04828)	0.043510 (0.18100)	0.126921 (0.22815)	0.126238 (0.17763)	0.221277 (0.26031)	0.011575 (0.12128)	0.104539 (0.19796)
0.449538 (0.32774)	0.631174 (0.41973)	0.222045 (0.24256)	0.089651 (0.20673)	96.29868 (1.04829)	0.043510 (0.18100)	0.126921 (0.22815)	0.126238 (0.17763)	0.221277 (0.26031)	0.011575 (0.12128)	0.104539 (0.19796)
0.449538 (0.32774)	0.631174 (0.41973)	0.222045 (0.24256)	0.089651 (0.20673)	96.29868 (1.04829)	0.043510 (0.18100)	0.126921 (0.22815)	0.126238 (0.17763)	0.221277 (0.26031)	0.011575 (0.12128)	0.104539 (0.19796)

Variance decomposition splits the variation in Indian oil prices with respect to the Sectorial Indices listed on the Bombay Stock Exchange (BSE) such as, Industrials, IT, Metals, O&G, Power, PSU, Realty, Auto, Bankex, Basic Materials, Energy, Capital Goods, Consumer Durables, CPSE, Finance, FMCG, Sensex, Telecom, and Utilities into the constituent shocks to the VAR. The variance decomposition specifies the extent of facts each variable adds to the other variables in the auto regression. Table 5 gives the information about the vector decomposition of Indian oil prices with respect to the Sectorial Indices listed on the Bombay Stock Exchange (BSE). Indian oil price indices represent the 33% variation in automobile sector for the short-term period (period 3) as well as long term period (period 12). Banking sector is not affected much with the Indian oil price volatility. Indian oil price volatility shows the high variation in the sectors Industrials, IT, Metals, Basic Materials, Capital Goods, CPSE, and Sensex. Indian Oil price indices signifies the 62% (for period 3) to 63% (for period 12) variation in the Industrials sector, 44% (for period 3 to period 12) shocks in the IT sector, 22% (for period 3 to period 12) variation in the Metals sector, 27% (for period 3) to 28% (for period 12) variation in the Basic Materials sector, 28% (for period 3) to 29% (for period 12) variation in the Capital Goods sector, 24 % ( for period 3 to period 12) variation in the Central public Sector, 16 % ( for period 3 to period 12) variation in Finance and FMCG sectors, 10 % ( for period 3 to period 12) variation in Utilities Sector, and .96% (for period 3) to 1.1% (for period 12) variation in the Telecom sector. INDIA oil prices shows the significant variation in the Sectorial Indices listed on the Bombay Stock Exchange (BSE) in both short and long run shocks. Maximum variation occurs in Industrials market whereas minimum is in Telecom industries and Energy sectors with respect to Indian oil prices volatility.



## 5. Conclusion

India is one of the largest importers of Oil in India. It is also estimated that India will be the largest consumer of oil in the world by the year 2035. Despite India being Oil-Importing nation, it has been observed its stock market returns are not much more influenced by the oil price changes.

From the analysis carried out we find that there is a lot of volatility seen in the oil prices from the year 2010 to the year 2017. The Jarque-Bera test shows that the series are not normally distributed. However, the Indian stock market has not been impacted by the changes in the oil price to a large extent. The unit root test justifies that the series are stationary at first difference. The coefficient of correlation shows a negative weak correlation between the oil prices and the stock market indices listed on BSE, indicating that change in oil price impacts the stock market returns to a very low extent. Hence, indicating that there exists a relationship between oil prices and stock market indices.

The granger causality test indicates that oil price changes do not cause any impact on the stock market returns, over a long run. But the reverse has been seen for few of the indices like INDUSTRIALS, METALS, CAPITAL GOODS, REALTY, SENSEX and AUTO. This result is in line with the research conducted by (Bandhopadhyay, Mondal, & Sahu, 2014), (Chittedi, 2012) and (Siddiqui & Seth, 2015)

A one standard deviation blow to Indian oil price volatility transmitted positive response for 2 days periods in BSE Metals, 4 days periods in Banking sector and Central Public sector (CPSE), 3 days periods in Auto sector and 2 to 4 days periods in Utilities sector stock market returns. A one standard deviation blow to Indian oil price volatility transmitted negative response for 1 day period in Capital Goods, 3 days periods for Telecom and PSU sectors, and 3 to 4 days periods in Metals, Auto and Energy sectors stock market returns.

Maximum variation occurs in Industrials market whereas minimum is in Telecom industries and Energy sectors with respect to Indian oil prices volatility.

The findings of this paper are contradictory to the findings in papers by (R & K, 2016), (D, 2013) and (Sriram, 2015).

Hence, the above results show that the Indian Stock Markets are not impacted by the oil price changes largely. Stock markets in India are largely driven by positive or negative sentiments created by other factors such as Governance, politics, fiscal policies, monetary policies, elections and other socio-economic factors. But the increase or decrease in the stock market returns due to decrease or increase in oil prices respectively, is less in India.

The findings could be used by investors to understand the dependency of stock market on oil prices. Investors can take wiser decisions to invest in companies that might get impacted by oil price changes. Since, Indian stock markets are not so dependent on oil price changes, investors can take into consideration other factors that impact the stock market returns. Students can refer to this paper to understand the dependence of stock market returns on oil prices and apply other techniques to find the dependency. They can also study other factors that impact the stock market returns in India.

The limitations of this study are that it does not take into consideration, other factors that must have caused the changes in the stock market indices such as election results, fiscal measures, other policies implemented, GDP growth, etc. which includes other socio-economic factors.

## References

- Alam, D.P., 2016. Factors Affecting Stock Market in India. *Split International Journals of Professionals*, pp. 7-14.
- Arouri, E.H., et al., 2011. Further Evidence on the responses of stock prices in GCC countries to Oil Price Shocks. *International Journal of Business*, pp. 89-102.
- Bairagi, P. and Rai, P.V., 2014. Impact of Changes in Oil Price on Indian Stock Market. *Proceedings of Manegme* (pp. 204-208). Research Gate.
- Bandhopadhyay, K., et. al, 2014. An Empirical study on the dynamic relationship between oil prices and Indian Stock Market. *Managerial Finance*, pp. 200-215.
- Bhattacharjee, P., 2013. A Study of the impact of the Crude Oil Prices on the Indian Economy.
- Bhunia, A., 2012. The Shock of the shock of crude price, stock price and selected macr- economic variables on the growth of Indian Economy. *Sumedha Journal Of Management*, pp. 82-88.
- Bouoiyour, J., Selmi, R., 2016. How diiferently does Oil Price Influence BRICS Stock Markets? *Journal Of Economic Integration*, pp. 547-568.
- Chittedi, K.R., 2012. Do Oil Prices matters for Indian Stock Markets? An Empirical Analysis. *Journal of Applied Economics and Business Research*, pp. 2-10.
- D, A., 2013, Impact of Oil Price Shocks on Stock Market Indices. *Arth Prabandh: A journal of Economics and Management* .
- Gomes, M. and Chaibi, A., 2014. Volatiliy Spillovers Between Oil Prices And Stock Returns: A Focus On Frontier Markets. *The Journal of Applied Business Research*, pp. 510-526.
- Jain, D.K., 2013. Oil Price Volatility and its Impact on the selected economic indicators in India. *International Journal of Management and Social Sciences Research (IJMSSR)*, pp. 63-70.
- Jones, C.M. and Kaul, G., 1996. Oil and the Stock Markets . *The Journal of Finance*.
- Kumar, M., 2014. The Impact of Oil Price Shocks on Indian Stock and Foreign Exchange Markets. *Money and Finance*, pp. 57-88.
- Liao, S.-Y., et. al., 2015. Will the oil price damage the stock market in a bull market? A re-examination of their conditional relationships. *Cross mark*, pp. 1136-1169.
- Maghyereh, A. and Amartani, B., 2016. Oil Price Uncertainty and Equity Returns: Evidence from Oil Importing and Exporting countries in the MENA region. *Journal of Financial Economic Policy*, pp. 64-79.
- Maheswaran, S. and Kumar, D., 2013. Correlation Transmission between crude oil and Indian Markets. *South Asian Journal of Global Business Research*, pp. 211-229.
- Mishra, S. and Debashish, D.S., 2016. Analysis of Volatility Spill over between Oil Prices and Exchange Rate in India: GARCH Approach. *SCMS Journal of Indian Management*, pp. 95-102.
- Mohanty, S.K., et.al., 2013. *Oil and Stock Market activity when the prices go up and down: the case of oil and gas industry*. Online: Springer Science+Business Media LLC 2012.
- Ramos, S.B. and Veiga, H., 2010. Assymetrical Effects of Oil Price Fluctuations in International Stock Market. *Statics and Economics Series*, pp. 2-26.
- Rangan, J., 2016. An Empirical Study of the Impact of Oil Prices on the Key Economic Indicators. *SUMEDHA journal of Management*, pp. 1-13.
- Sehgal, S. and Kapur, R., 2012. Relationship between oil price shocks and Stock Market Performance: Evidence for select Global Equity Markets. *Vision*, pp. 81-92.
- Siddiqui, S. and Seth, N., 2015. Do Global Oil Price Changes affect the Indian Stock Market Returns? *Journal of Management & Public Policy*, pp. 29-41.
- Sriram, M., 2015. Dynamic Linkages between BSE Sensex and Crude Oil Price- An Empirical Study in India. *International Journal of Information, Business and Management* pp. 28-41.
- Wadud, M.I. and Ahmed, A.J., 2016. Oil Price Volatility, Investment and Sectoral Responses: The Thai Experience. *The Journal Of Developing Areas*, pp. 357-379.
- Wadud, M.I. and Ahmed, A.J., 2017. Oil Price Volatility and Sectoral Returns uncertainties: Evidence from a Threshold Based Approach For the Australian Equity Market. *The Journal of Developing Areas*, pp. 330-342.

# Evolution of the main macroeconomic indicators as a result of Romania's integration into the EU

**PhD. Ana-Maria URÎTESCU**

Bucharest University of Economic Studies, Romania

ana.uritescu@fin.ase.ro

**Abstract.** *The purpose of this paper is to analyze the impact of the accession of our country to the EU based on the economy. The economic indicators analyzed are gross domestic product, budget deficit, government debt, government spending, government revenue, export and import. The analysis involves creating a multifactorial regression model with a dependent variable (gross domestic product) and as independent variables all other sets of data. Also, Granger's causality will be used to study the relationship between variables. The model results indicate a direct relationship between gross domestic product and the share of government budget deficits, the import on the gross domestic product, and an inversely relationship between gross domestic product and the shares of government debt, Government revenues and exports in the gross domestic product.*

**Keywords:** GDP, debt, deficit, government expenditure, government revenue, Granger Causality.

**JEL Classification:** C51, E60, H60.

## Introduction

Romania's accession to the European Union was a long-awaited moment. In order to be a full member of the EU, our country had to respect a number of conditions and criteria for convergence with the European Union. The moment of accession, 1 January 2007, was an important step for Romania towards the developed countries.

The present paper aims to analyze the evolution of some indicators during the 10 years period since EU accession. The aim of the paper is to highlight the impact of budget deficit, public debt, government spending, government revenue, import and export on economic growth. At the same time, the causal relationship between the studied indicators is followed.

The paper contains a brief synthesis of the literature, the evolution of time series compared with the UE 28 average, Granger causality testing, the creation of the multifactorial regression model.

## Literature review

There are numerous studies on the relationship between economic growth and budget deficits, public debt, government spending, government revenues, exports and imports. Below, are described some of these models, and some are synthesized in the table in this section.

Alberto Alesina and Silvia Ardagna (2010), using data from 1970 to 2007 for OECD countries are studying the effects of fiscal stimuli and fiscal adjustments effects using a simple regression. According to this study, tax cuts can increase the economic growth more than spending increases. At the same time, spending cuts, without tax increases, can reduce deficits and public debt. At the same time, spending cuts, without tax increases, can reduce the deficits and public debt.

Cristina Chercherita and Philipp Rother (2010) are conducting a study analyzing the impact of government debt on the euro area's economic growth. Using data between 1970 and 2011, a non-linear public debt impact on GDP growth per capita is obtained. Thus, long-term public debt growth is associated with lower economic growth rates.

Zuzana Szkorupova (2014) conducted a study analyzing the relationship between foreign direct investment, economic growth and exports to Slovakia. The data used are quarterly, between 2001 and 2010. The econometric method used is data co-integration and Vector error correction (VEC). The result of the analysis indicates a long-term positive relationship between the three variables. One of the test's conclusions is that export encourages economic growth.

**Table 1.** *Empirical Studies*

Autor	Aim of study	Econometric Methods	Results	Year
John A. Karikari	Role of government in economic growth	Regression time series	Negative relationship between revenue, spending and economic growth	1995
Francisco F. Riberio Ramos	Relationship between exports, imports and economic growth	Granger Causality	It doesn't exist unidirectional causality between the variables considered	2001
Alexander Quaicoe, Anthony Q.Q. Aboagye, Godfred A. Bopkin	Impact of free zone exports and investments on economic growth	Vector error correction model	Significant negative relationship	2007
Nikolaos Dritsakis	Relationship between exports and economic growth	Error correction model, Granger Causality	Causal effect on the development process for EU and USA and no causal relationship between the variables for Japan	2007

## Methodology of research

In order to study the economic situation of our country during 2007 and 2017, I used quarterly data, between the first quarter of 2007 and the second quarter of 2017. The data were taken from Eurostat. The selected data series are: gross domestic product main components-chain linked volumes, percentage change compared to same period in previous year, budget deficit, government debt, government expenditures, government revenues, exports of goods and services, imports of goods and services. These series of data are represented by their weight in gross domestic product. Data was processed using Eviews and Excel.

Starting from the analysis of the evolutions of these indicators, it was created a multifactorial regression model that has a dependent variable as the gross domestic product and as independent variables all other variables. The purpose of this model is to highlight the relationship between these indicators in Romania, during the studied period.

The stages of this study include: data processing, data analysis, testing the stationarity of data series, creating the correlation matrix, descriptive statistics of the data series, testing Granger Causality, creating the regression model, testing the model's validity and interpretation of results.

## Data series analysis

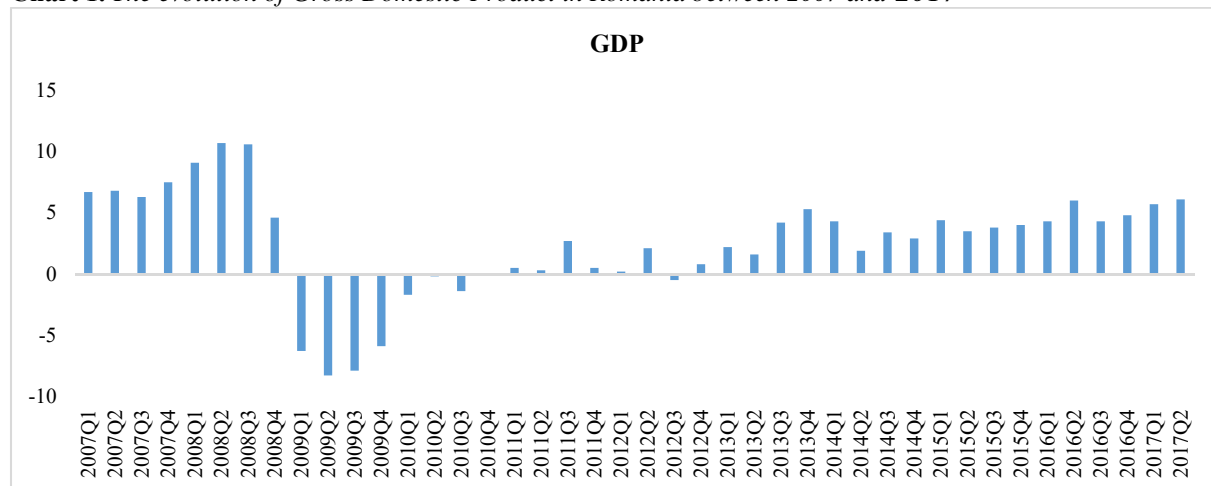
Romania's accession to the European Union has been an important step in the history of our country. This stage was preceded by a long pre-accession process. Both, in the period before 1 January 2007 and in the years to come, our country had to respect the values of macroeconomic indicators imposed by the European Union.

The analysis of the data series was done by graphical representation of the evolution of the seven indicators analyzed.

About the gross domestic product data series, it can be said that it had an upward trend until the second quarter of 2008 when it also registered the maximum value for the studied

Period, of 10.7%. In the following period, decreases were recorded to the minimum of the survey period -8.3%, in the second quarter of 2009. After this period, the trend was generally increasing.

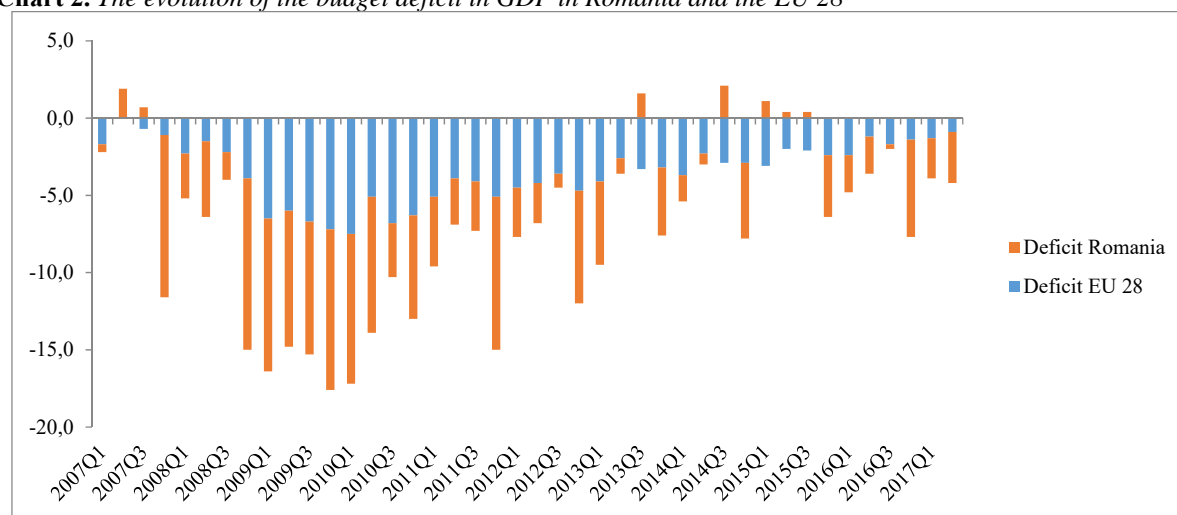
The increasing trend of gross domestic product in the first part of the study period, can be justified by increased consumption and foreign investment as a result of joining the European Union. The minimum values of the studied period are due to the global economic situation, the economic crisis and the economic imbalances that have affected the economy of our country. The decrease in private consumption and investment have reduced the gross domestic product. Over time, gross domestic product has not experienced any significant drops or increases compared to the minimum and maximum values. In the last part of the survey period, gross domestic product reaches 6.1% in the second quarter of 2017, a growth generated, primarily, by population consumption.

**Chart 1.** *The evolution of Gross Domestic Product in Romania between 2007 and 2017*

**Source:** author's processing

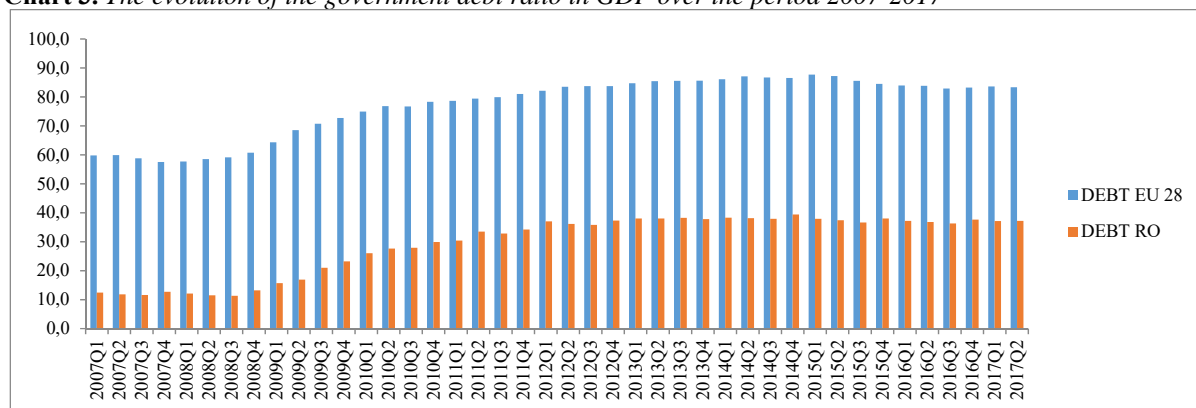
Regarding the budget deficit, we can see that the extreme values are -11.1% recorded in the fourth quarter of 2008 and 2.1% in the third quarter of 2014. Since 2001, Romania has met the criterion referring to the budget deficit of 3% from gross domestic product. With the start of the economic crisis in 2008, this is changing. Romania exceeds the limit by 2 percentage points. In 2009, the budget deficit is rising even more, and in 2010 the recovery measures begin: the wages of the budgetary employees are cut by 25%, the increase of the VAT to 24%. Starting with 2013, Romania reaches the budget deficit below 3%, and in the following periods it remained below this limit.

The chart below also shows the EU-28 budget deficit in order to highlight the high levels in our country compared to the European average of the same period.

**Chart 2.** *The evolution of the budget deficit in GDP in Romania and the EU 28*

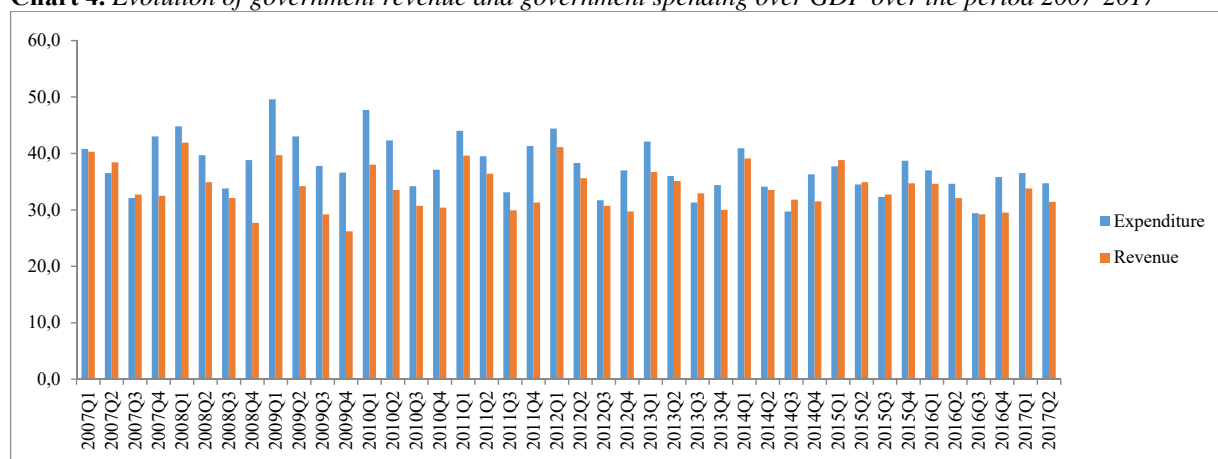
**Source:** author's processing

The public debt of our country varied throughout the studied period. Values were below 60% of gross domestic product. The minimum figure was recorded in the third quarter of 2008 (11.3%), and the highest of 39.4% was recorded in the fourth quarter of 2014. Even if the 60% from gross domestic product has not been reached or exceeded, the upward trend of these data series and the rhythm of growth remain worrying. Compared to the EU-28 average (77.1%), we are close to half (29.5%), but efforts should be made to reduce this indicator, which at the end of the studied period reached 37.2%, meaning three times higher than the beginning of the period.

**Chart 3.** *The evolution of the government debt ratio in GDP over the period 2007-2017*

Source: author's processing

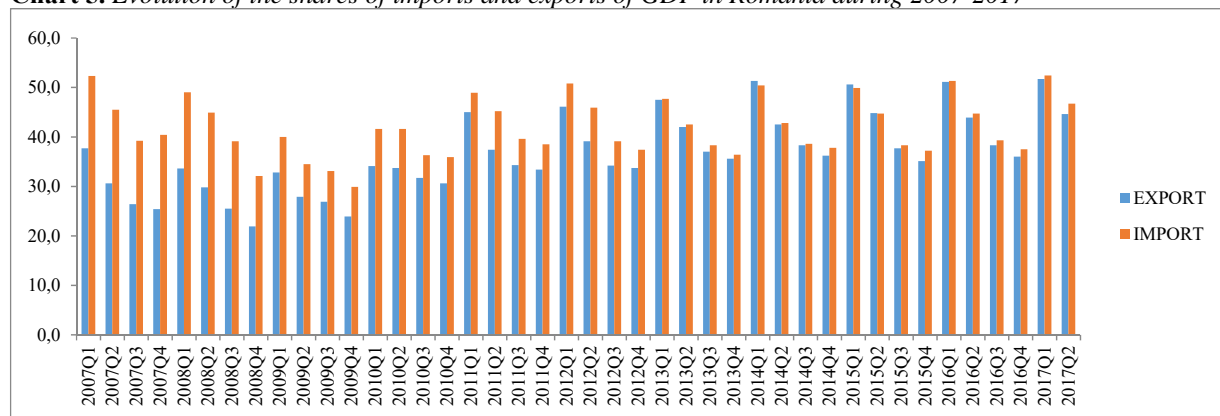
As can be seen in the figure below, government expenditures have almost exceeded the level of government revenue over the surveyed period. This was also observed in the data series of the budget deficit figures. The highest amount of government spending was recorded in the first quarter of 2009 (49.60%) and the minimum value, 29.4%, was recorded in the third quarter of 2016. For government revenues, the highest value (41.9%) was reached in the first quarter of the year 2008 and a minimum of 26.20% was recorded in the fourth quarter of 2009.

**Chart 4.** *Evolution of government revenue and government spending over GDP over the period 2007-2017*

Source: author's processing

The last graphical representation shows the evolution of imports and exports from the first quarter of 2007 until the second quarter of 2017. The extremes of this period are represented by the minimum import value of 29.9% achieved in the last quarter of 2009 and the maximum value of 52.4% in the first quarter of 2017. For exports, the minimum value was reached in the last quarter of 2008 (21.9%) and the maximum value, 51.70%, in the first quarter of 2017.

The minimum value recorded for imports in 2009 is explained by the economic situation at that time.

**Chart 5.** *Evolution of the shares of imports and exports of GDP in Romania during 2007-2017*

Source: author's processing

### The Correlation Matrix

Using the Eviews program, it is made the correlation matrix for the initial data series. The centralized results in the table below show a negative correlation between government debt, government expenditures and gross domestic product. There is a positive correlation between import, export, deficit, government revenue and gross domestic product. The descriptive statistics of the data series are contained in Appendix 2.

**Table 2.** *The correlation matrix of data series*

	GDP	Import	Export	Deficit	Debt	Government revenue	Government expenditures
GDP	1.000000	0.417549	0.165097	0.483198	-0.094106	0.129939	-0.288469
Import	0.417549	1.000000	0.763426	0.437580	0.142992	0.764075	0.274666
Export	0.165097	0.763426	1.000000	0.476424	0.696899	0.445425	-0.019676
Deficit	0.483198	0.437580	0.476424	1.000000	0.293527	0.256514	-0.603995
Debt	-0.094106	0.142992	0.696899	0.293527	1.000000	-0.137613	-0.350719
Government revenue	0.129939	0.764075	0.445425	0.256514	-0.137613	1.000000	0.615282
Government expenditures	-0.288469	0.274666	-0.019676	-0.603995	-0.350719	0.615282	1.000000

Source: author's processing

### Testing the stationarity of the data series

Before estimating the regression model, it was applied a data series stationarity test. To test the stationarity of the data series it is used the Augmented Dickey Fuller (ADF) test. The following table lists the values of the t-statistical test, the probabilities associated with it, and the values for the 1%, 5% and 10% levels. According to this test, the null hypothesis is rejected for each data series ( $H_0$ : the data series has a single unit root). The values of the T-statistic are inferior to the values associated with 1%, 5% and 10% levels, and the probability of the T statistic is higher than 5%. The conclusion of this test is that none of the seven sets of data is stationary.

**Table 3.** *The results of the ADF test*

	t-statistic	1%	5%	10%	prob
GDP	1.883307	3.600987	2.935001	2.605836	0.3366
DEFICIT	1.354699	3.621023	2.943427	2.610263	0.5936
DEBT	2.017596	3.605593	2.936942	2.606857	0.2784
EXPENDITURE	0.261840	3.615588	2.941145	2.609066	0.9213
REVENUE	2.923490	3.626784	2.945842	2.61131	0.0525
EXPORT	1.548662	3.639407	2.951125	2.614300	0.4973
IMPORT	1.356597	3.639407	2.951125	2.614300	0.5916

Source: author's processing



Following the ADF test results for the series, we applied differences on them for turning them into stationary series. All series become stationary by applying the first difference. The results of the ADF test applied for the series in difference are shown in the table below.

**Table 4.** Results of the ADF test after applying the first difference

	t-statistic	1%	5%	10%	prob
D_GDP	5.048181	2.632688	1.950687	1.616059	0.0000
D_DEFICIT	13.54149	2.628961	1.950117	1.611339	0.0000
D_DEBT	5.894734	2.628961	1.950117	1.611339	0.0000
D_EXPENDITURE	9.252559	2.630762	1.950394	1.611202	0.0000
D_REVENUE	9.260008	2.630762	1.950394	1.611202	0.0000
D_EXPORT	3.138460	2.636901	1.951332	1.610747	0.0027
D_IMPORT	4.311083	2.636901	1.951332	1.610747	0.0001

Source: author's processing

### Testing the Granger causality

To determine if there are links between the studied variables, it was applied the Granger causality test on the original data. The results obtained are included in Appendix 1. The probabilities of F statistic resulting from causality testing between import and export indicate a bidirectional relationship between the two variables. Negative hypotheses are rejected, so Export causes Granger import and Import causes Granger export. Between import and public debt is a unidirectional relationship, import causes public debt. There is a one-way relationship between government revenue and government spending. Revenue causes Granger spending. Income also causes Granger public debt. Unidirectional relationship exists also between public deficit and expenditure, public expenditure and debt. Bidirectional relationship exists between public debt and export, public debt causes Granger export, and export causes Granger public debt.

Using these series of stationary data, we created the multifactorial regression model that has the gross domestic product as the dependent variable, and as independent variables the budget deficit, government debt, government expenditures, government revenues, imports and exports.

The regression equation is:

$$D\_GDP = \alpha + \beta_1 \times D\_DEFICIT + \beta_2 \times D\_DEBT + \beta_3 \times D\_EXPENDITURE + \beta_4 \times D\_REVENUE + \beta_5 \times D\_EXPORT + \beta_6 \times D\_IMPORT$$

The estimation of regression parameters was made using the ordinary least squares method (OLS).

The results obtained are listed in the following table:

**Table 5.** Results of estimation of regression model parameters

Variabile	Coefficient	Std. Error	t-Statistic	Prob.
C	0.442984	0.399545	1.108721	0.2753
D_DEFICIT	1.158031	4.100910	0.282384	0.7794
D_DEBT	-0.424018	0.296691	-1.429158	0.1621
D_EXPEND	1.120235	4.108028	0.272694	0.7867
D_REVENUE	-1.376890	4.108984	-0.335093	0.7396
D_EXPORT	-0.730142	0.219936	-3.319800	0.0022
D_IMPORT	0.961988	0.253051	3.801552	0.0006
R-squared	0.333490			
Prob(F-statistic)	0.023944			
Included observations	41 after adjustments			

Source: author's processing

The results returned by Eviews indicate that the regression equation becomes:

$$D\_GDP = 0.442984 + 1.158031 \times D\_DEFICIT - 0.424018 \times D\_DEBT + 1.120235 \times D\_EXPENDITURE - 1.376890 \times D\_REVENUE - 0.730142 \times D\_EXPORT + 0.961988 \times D\_IMPORT$$

The coefficients associated with the independent variables highlight the impact they have on the dependent variable. Thus, for a change with one unit of the budget deficit, Gross Domestic Product increases by 1.158031 units. Parameter  $\beta_1$  has a default error of 4.100910. The probability associated with this test is  $0.7794 > 5\%$ , which indicates that the estimated parameter is not statistically significant.

At a change in government debt ratio in GDP, Gross Domestic Product decreases by 0.424018 units. The probability associated with this parameter, 0.1621, indicates that it is not significant.

If the share of expenditure in Gross Domestic Product changes by one unit, Gross Domestic Product increases by 1.12 unit.

Changing the share of government revenue in gross domestic product by one unit leads to a 1.37-point decline in gross domestic product.

Following a change in the share of imports in GDP, the GDP increases by 0.73 units, and for one unit change in the share of exports in GDP it drops by 0.96 units. The probabilities associated with  $\beta_5$  and  $\beta_6$ , 0.0022 and 0.0006, indicate that these two indicators are statistically significant.

The signs of these coefficients indicate a direct relationship between gross domestic product and the share of the budget deficit in GDP, the share of government expenditures in GDP, the share of imports in GDP and, at the same time, a negative relationship between the gross domestic product and the share of public debt in GDP, the share of government revenues in GDP and the share of exports in GDP.

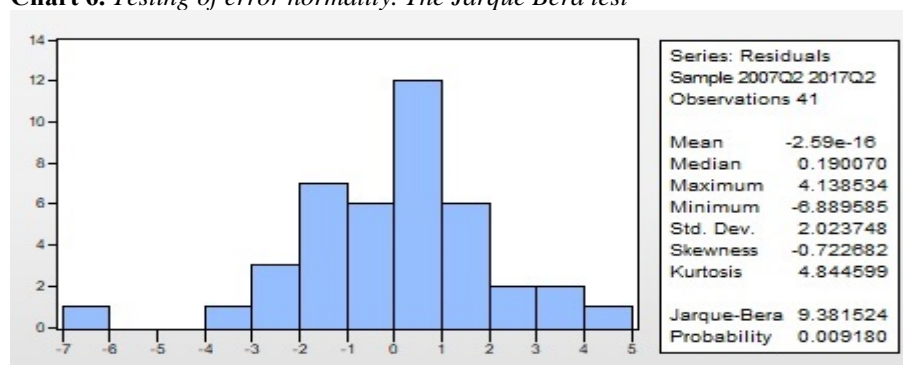
Analyzing the value associated with  $R^2$ , 0.33, we can say that there is a link between the dependent variable and the other variables, but not a very strong one. 33.3490% of gross domestic product variation is explained by the influence of independent variables.

The validity of the model is confirmed by the probability associated with the statistical T test with 0.023944, below the 5% level.

Autocorrelation error testing is performed using the Durbin Watson test. The value of this test is 1.758616, corresponding to 2, which indicates that the errors are not auto correlated.

The error normality test is performed using the Jarque Bera test. The probability associated with this test is 0.009180.

**Chart 6.** Testing of error normality. The Jarque Bera test



**Source:** author's processing

## Testing heteroskedasticity using the White test

**Chart 7.** *The results of White Test*

Heteroskedasticity Test: White			
F-statistic	6.799506	Prob. F(6,34)	0.0001
Obs*R-squared	22.36290	Prob. Chi-Square(6)	0.0010
Scaled explained SS	29.56237	Prob. Chi-Square(6)	0.0000

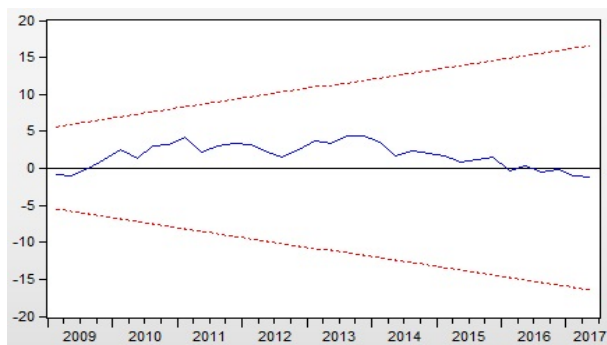
**Source:** author's processing

The results of this test indicate that the probability of F-statistic is lower than 0.05. It means that the errors are homoscedastic.

## Testing the stability of the equation and the coefficients.

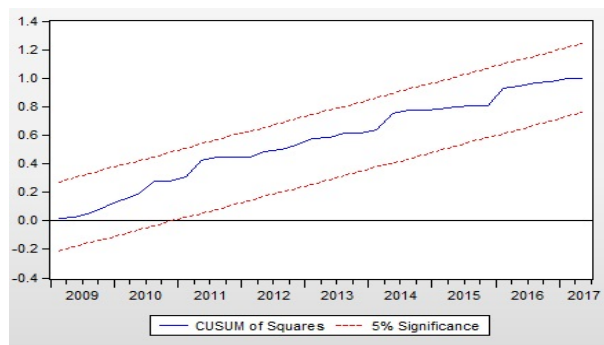
To test the stability of the equation and coefficients it is used the CUSUM TEST and CUSUM of Squares Test. The results are included in the images below:

**Chart 8.** *Cusum test results*



**Source:** author's processing

**Chart 9.** *Cusum of squares test results*



**Source:** author's processing

According to the Cusum test, the cumulative sum of recursive errors of the regression equation is between critical values of 5%. At the same time, the sum of recursive square errors, according to the Cusum of Squares Test, is comprised of critical values. Thus, the results of the two tests indicate that the estimated equation and coefficients are stable.

The regression model achieved is a valid model considering the results obtained. The probabilities associated with the estimated coefficients indicate that the variables represented by the weight of the budget deficit in the GDP, the share of public debt in the GDP, the share of the budgetary expenditures and the share of the budgetary revenues in the GDP are not statistically significant for the model created. In order to improve the results, the model can be resumed for the elimination of the insignificant statistically significant arias.

## Conclusions

The purpose of this paper was to analyze the evolution of some important macroeconomic indicators for Romania during the years as an EU member.

Granger causality test indicates the causal relationship between the variables studied.

The creation of the regression model highlights the link between the weights of the independent variables in GDP and the gross domestic product.

This study aims to highlight the impact of EU membership on key macroeconomic indicators. The importance of the paper is due to the fact that studying the evolutions of the analyzed indicators can be aware of the level at which Romania is economically.

### Further development

For further development and for better results the insignificant variables can be removed; the database can be expended over several years to compare the pre-accession and post-accession period. Also, it can be done a comparison with Bulgaria that has the same date of entry into the EU.

---

### References

---

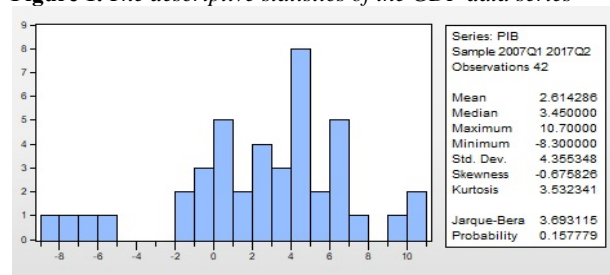
- Alesina, A. and Ardagna, S., 2010. Large Changes in Fiscal Policy: Taxes versus Spending, *Tax Policy and the Economy*, Vol. 24.
- Annual Reports of the National Bank of Romania 2007-2016.
- Chercherita, C. and Rother, P., 2010. The impact of growing government debt on economic growth an empirical investigation for the euro area, *Working paper*.
- Dritsakis, N., 2007. Exports and Economic growth: an empirical investigation of E.U, U.S.A and Japan Using Causality tests, *Department of Applied Informatics University of Macedonia*.
- Karikari, J.A., 1995. Government and Economic Growth in a Developing Nation: The Case of Ghana, *Journal of economic development*, Vol. 20, No. 2, December.
- Obreja Brasoveanu, L., 2007. Impact of fiscal policy on economic growth, *ASE Publishing House*, Bucharest.
- Quaicoe, A., Aboagye, A.Q.Q. and Bokpin, G.A., 2017. Assessing the impact of export processing zones on economic growth in Ghana, *International Business and Finance* 42, pp. 1150-1163.
- Ramos, F.R., 2001. Exports, imports, and economic growth in Portugal: evidence from causality and cointegration analysis, *Economic Modelling* 18, pp. 613-623.
- Stancu, S., 2011. Econometrics Theory and Applications Using Eviews, *ASE Publishing House*, Bucharest.
- Szkorupova, Z., 2014. A casual relationship between foreign direct investment, economic growth and export for Slovakia, *Procedia Economics and Finance* 15, pp. 123-128.
- <[www.ec.europa.eu/eurostat/](http://www.ec.europa.eu/eurostat/)>

**Appendix 1. Granger causality results**

Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
D IMPORT does not Granger Cause D GDP	39	0.22524	0.7995
D GDP does not Granger Cause D IMPORT		0.49178	0.6158
D REVENUE does not Granger Cause D GDP	39	0.30067	0.7423
D GDP does not Granger Cause D REVENUE		0.17803	0.8377
D EXPORT does not Granger Cause D GDP	39	0.11687	0.8901
D GDP does not Granger Cause D EXPORT		0.01894	0.9812
D EXPEND does not Granger Cause D GDP	39	0.27555	0.7608
D GDP does not Granger Cause D EXPEND		0.44850	0.6423
D DEFICIT does not Granger Cause D GDP	39	0.43894	0.6483
D GDP does not Granger Cause D DEFICIT		0.21050	0.8112
D DEBT does not Granger Cause D GDP	39	0.72792	0.4903
D GDP does not Granger Cause D DEBT		1.71477	0.1952
D REVENUE does not Granger Cause D IMPORT	39	0.16407	0.8494
D IMPORT does not Granger Cause D REVENUE		0.59270	0.5584
D EXPORT does not Granger Cause D IMPORT	39	4.15896	0.0242
D IMPORT does not Granger Cause D EXPORT		4.26192	0.0223
D EXPEND does not Granger Cause D IMPORT	39	14.3400	3.E-05
D IMPORT does not Granger Cause D EXPEND		8.96307	0.0007
D DEFICIT does not Granger Cause D IMPORT	39	18.0578	5.E-06
D IMPORT does not Granger Cause D DEFICIT		31.5151	2.E-08
D DEBT does not Granger Cause D IMPORT	39	2.00453	0.1503
D IMPORT does not Granger Cause D DEBT		6.41572	0.0043
D EXPORT does not Granger Cause D REVENUE	39	0.05660	0.9451
D REVENUE does not Granger Cause D EXPORT		0.42866	0.6549
D EXPEND does not Granger Cause D REVENUE	39	23.2594	4.E-07
D REVENUE does not Granger Cause D EXPEND		6.24900	0.0049
D DEFICIT does not Granger Cause D REVENUE	39	23.5496	4.E-07
D REVENUE does not Granger Cause D DEFICIT		21.7423	8.E-07
D DEBT does not Granger Cause D REVENUE	39	0.91137	0.4116
D REVENUE does not Granger Cause D DEBT		5.22744	0.0105
D EXPEND does not Granger Cause D EXPORT	39	16.9309	8.E-06
D EXPORT does not Granger Cause D EXPEND		7.25136	0.0024
D DEFICIT does not Granger Cause D EXPORT	39	21.9445	8.E-07
D EXPORT does not Granger Cause D DEFICIT		32.2201	1.E-08
D DEBT does not Granger Cause D EXPORT	39	3.31840	0.0483
D EXPORT does not Granger Cause D DEBT		3.56234	0.0394
D DEFICIT does not Granger Cause D EXPEND	39	6.12585	0.0053
D EXPEND does not Granger Cause D DEFICIT		21.4674	9.E-07
D DEBT does not Granger Cause D EXPEND	39	1.79005	0.1823
D EXPEND does not Granger Cause D DEBT		4.24763	0.0226
D DEBT does not Granger Cause D DEFICIT	39	1.74586	0.1898
D DEFICIT does not Granger Cause D DEBT		0.25652	0.7752

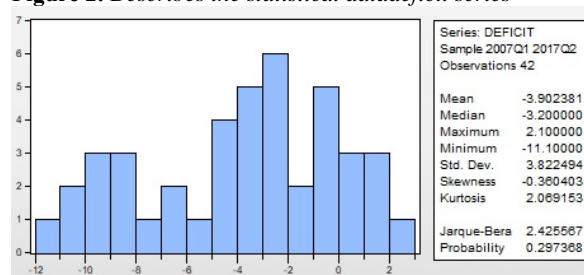
## Appendix 2. Descriptive statistics of data series

**Figure 1.** The descriptive statistics of the GDP data series



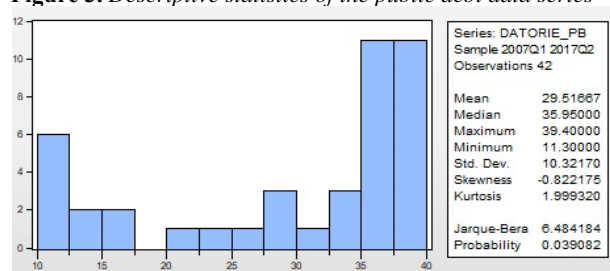
Source: own processing

**Figure 2.** Describes the statistical data deficit series



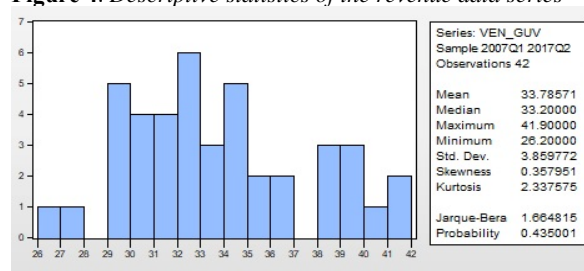
Source: own processing

**Figure 3.** Descriptive statistics of the public debt data series



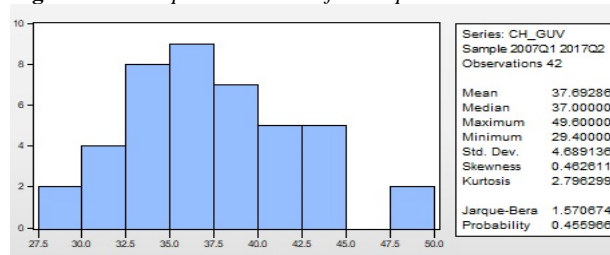
Source: own processing

**Figure 4.** Descriptive statistics of the revenue data series



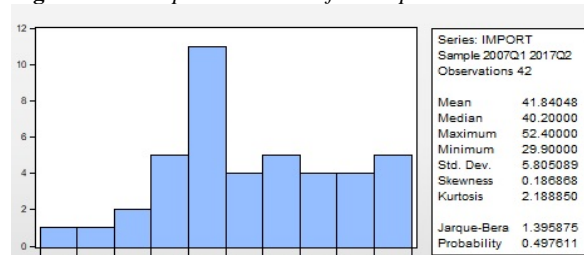
Source: own processing

**Figure 5.** Descriptive statistics of the expenditure data series



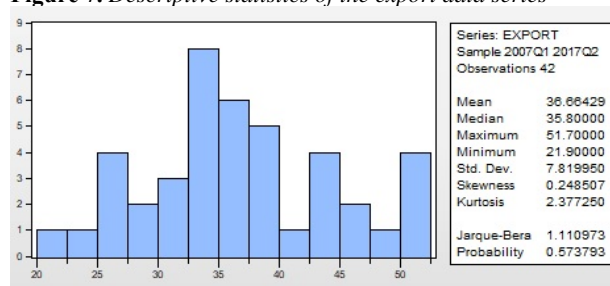
Source: own processing

**Figure 6.** Descriptive statistics of the import data series



Source: own processing

**Figure 7.** Descriptive statistics of the export data series



Source: own processing

# **A direct measurement of corporate financial constraints of SMEs and large firms in Mauritius.**

## **A firm level survey analysis**

**Chakeel PRAYAGSING**

University of Mauritius, Moka, Mauritius

prayagsic@gmail.com

**Kheswar JANKEE**

University of Mauritius, Moka, Mauritius

c.jankee@uom.ac.mu

**Abstract.** *Researchers have acknowledged that FC is a variable that is not directly observable or available on the balance sheet of companies. In this Paper, we extend the literature on FC and provide evidence on variables that directly measure the FC in a well-defined sample of Mauritian enterprises. These are: firms' dividend payment behaviour and perceptions on same; forms of dividend payments and policies adopted; preferred choice for financing long term projects and financing difficulties of firms & the sources of finance used. Both a deductive and quantitative strategies are adopted to provide for a direct measurement of FC. Data from a stratified sample of the top 100 companies as well as a unique firm level survey data obtained from a sample of 300 SMEs via simple random sampling are used. Results obtained from these samples serve the purpose of the research given that firms from two different extremes are studied as follows: the top largest 100 firms and the SME's. The top 100 firms are those with high asset values and financial position. They mainly belong to group structures and operate internal financial markets amongst sister companies. Hence, FC is expected to be low for such companies. In contrast, SMEs are basically small and medium enterprises and can be characterized as having difficult access to financial markets caused by excessive cost of finance due to asymmetric information and moral hazard. It is found that both large firms and SMEs are financially constraint, the degree of FC however varying on the corporate structure of firms.*

**Keywords:** financial constraints, direct measures, survey, deductive approach, dividend.

**JEL Classification:** G39.

## 1. Introduction

The measurement and determination of financial constraints (FC) are issues that have interested researchers in both developed and developing countries (see for e.g. Fazzari et al., 1988; Blundell et al., 1999; Schiantaralli, 1996; Berger and Udell, 1998; Kaplan and Zingales, 1997, 2000; Hadlock and Pierce, 2010; Kira, 2013). However, there have been a number of controversies on the exact measurement of FC. Even though some authors have used firm level surveys to determine the FC of firms (e.g., Bonnet et al. (2005); Kira (2013)), yet there is a missing gap in the literature on the direct measurement of FC, especially in emerging economies in Africa such as Mauritius.

The aim of this paper is to supplement the empirical literature and provide evidence on variables that directly measure the FC in a well-defined sample of Mauritian enterprises. These are: firms' dividend payment behaviour and perceptions on same; forms of dividend payments and policies adopted; preferred choice for financing long term projects and financing difficulties of firms & the sources of finance used. To this end, a deductive approach with a quantitative strategy is adopted to measure the financial constraints of firms. Data from a stratified sample of the top 100 companies as well as a unique firm level survey data obtained from a sample of 300 SMEs are used.

## 2. Organisation of the chapter

This chapter is organized as follows: following the introduction in section 1, section 3 reviews the literature on the measurement and determination of FC, followed by a critical review of current literature. Section 4 addresses methodological issues while section 5 interprets the results of the survey. Section 6 concludes the paper.

## 3. Review of literature on the measurement and determinants of financial constraints

Over the years, researchers have used various measures of FC and these are classified into direct and indirect measures.

### 3.1. Indirect measures of FC

#### (i) *Investment-Cash flow sensitivity (I/CF)*

Many authors have concluded on the existence of FC by the coefficient of the (I/CF) relationship. A firm was classified as financially constrained when it was dependent on internal cash flow and the coefficient of I/CF relationship was significantly positive.

Fazzari et al. (1988)<sup>(1)</sup> deduced that firms were financially constrained when they had no other choice, other than resorting to internal funds to finance investment. In different sub samples, which were classified as per some priori classification, it was found that some firms had a higher cost of external finance. A firm was thus more financially constrained when its (I/CF) sensitivity was larger. Similar results were found by Hadlock (1998) for the US companies, Chapman et al. (1996) for Australian companies, Guariglia (2008) for the UK firms, Schaller (1993) for Canadian firms, Fagiolo and Luzzi (2006) for Italian firms and Lamont (1997) for US oil companies.

The I/CF sensitivity was used by Hoshi et al. (1991)<sup>(2)</sup> to measure FC of Japanese firms, which were classified between those with good banking relationship (and hence were expected to have an easier access to finance) and those with no such relationship (having difficult access to finance).

Using a flexible error correction investment model in a panel data setting, Mizen and Vermuelen (2005) analyzed the impact of financial systems on the I/CF relationship in a



sample of 804 German firms and 378 in the UK. They found empirical proof of the I/CF sensitivity, which was more in market oriented financial systems such as in the UK than in Germany. However, such sensitivity could not be found in alternative sub-samples, rendering such a relationship doubtful.

Yet, over time, the I/CF sensitivity has been severely criticized as a measure of FC. These include the difficulties involved in measuring Tobin's Q in the investment equations, the use of an unreliable priori classification of the different samples, constant value for Tobin's Q (investment opportunities), and contrary results to the usual I/CF relationship being found.

Some examples include Allayannis and Mozumdar (2004), Agca and Mozumdar (2008), Brown and Petersen, (2009). In some cases, a very weak relationship between I/CF was obtained. Surprisingly, Cleary et al. (2004) found the I/CF relationship to be U-shaped.

Cleary (1999) employed a discriminant score analysis from different financial variables and constructed a measure of FC in a large cross section of 1,317 firms over the period 1987 to 1994. The Tobin's Q model was estimated for non-financial and non-utility firms that were traded on the US stock exchange. Contrary to the results of FHP, financially constrained firms had lower I/CF sensitivities because these firms preferred to save the profits as retained earnings for future uses. Hence, investment in the current period was reduced, even though the firms were cash rich.

In a more recent study, Huafeng and Shaajun (2012) used time series data over the financial crisis period of 2007-2009 for US firms to prove that the I/CF sensitivity as a measure of FC was not valid. They found that such sensitivities had fallen during that period, being about 0.3 in the 1960's, to below 0.03 in 1960 and was almost zero during the financial crisis. These results were robust across alternative model specifications and sensitivities (firms with different corporate governance structure and with different market power).

In order to avoid some of the difficulties involved in estimating empirical investment equations, some other authors have used firm level cash flow sensitivities to measure the FC of firms. For instance, Hovakimian and Hovakimian (2009) used the responsiveness of firm investment following changes in cash flow (time average of investment). Another method used was by D'Espallier et al. (2008) who estimated the CF slopes of I/CF equations.

Departing from FHP, Huang (2002) studied the I/CF sensitivity in a sample of US listed companies and found a non-linear relationship between I/CF sensitivity and financial constraints.

#### *(ii) Estimates of Q theory of investment*

Since Tobin's  $Q^{(3)}$  contains fundamental information for the firm and the latter uses it for its investment decision, some authors have measured the FC of firms by estimating Q investment equations. Keeping the value of Q constant, FHP found that investment was dependent on internal finance. Similarly, Blundell et al. (1992) found a significantly positive impact of cash flow on the Q investment equation.

Chirinko (1993) used data for 532 quoted UK manufacturing firms over the period 1971-1986 and estimated Q investment regressions to determine the FC of firms. In a similar vein, Gomes (2001) measured the dependence of internal funds on investment and the biasness of the Q investment equations. Hayashi and Inoue (1991) used data from 523 quoted UK manufacturing firms over the period 1977 to 1986 and found a positive impact of the cash flow variable in investment equations, over and above Tobin's Q, which was less significant. Yet, a major challenge in the use of Q investment equations to measure FC is the measurement error in Tobin's Q (see Bond and Cummins, 2001).

### *(iii) Cash-flow sensitivity of cash*

Costly external finance forces firm to forgo profitable investment opportunities and coerce them to use internal rather than external financing. Internal financing is generally considered as being the cheapest source of finance. Some authors have thus used the cash flow sensitivity of cash to measure the extent of FC whereby a firm is considered as financially constrained if it saves cash resources from its cash flow.

Almeida et al. (2004) measured FC by estimating the sensitivity of cash to cash flows. A model of liquidity demand was constructed and an empirical equation was derived. Han and Qiu (2007) and Baum et al. (2011) conducted similar studies and found that financially constrained firms depend more on internal cash flows. However, such a hypothesis has been challenged in Pal and Ferrando (2010).

### *(iv) Firm growth equations*

A number of researchers have measured FC by measuring the sensitivity of firm growth to cash flow, that is, to what extent the growth of the firm is explained by the cash flow of the firm. Several measures of firm growth have been used in the literature, such as employment growth (Oliveira and Fortunato, 2006), growth of fixed assets (Carpenter and Peterson, 2002) and sales growth (Fagiolo and Luzzi, 2006). These studies have generally found that FC had a negative and significant impact on firm growth. However, no specific measurements of FC have been undertaken and cash flow was used only as an indicator of FC.

### *(v) Credit ratings*

Some other authors have used credit ratings to assess the degree of FC. A credit rating agency gives a rating on the degree of FC, based on the ease of access and the constraints in obtaining external finance. For instance, by using data from the manufacturing sector for Italian firms over the period 1998-2003, Bottazzi et al. (2008) analysed the effects of FC on a number of firm level variables.

### *(vi) Euler equation tests*

Some authors (e.g. Whited, 1992, Bond and Meghir, 1994; Love, 2003) have used the Euler equation to solve for an optimum investment model. Consequently, any deviation from an optimum plan and non-observance of some parameter restrictions were interpreted as indicator of FC. The most important advantage of such an approach is that it requires empirical testing.

## **3.2. Direct measures of FC**

Some authors have obtained direct measures of FC and a number of techniques were used as follows:

### *(i) Direct categorisation of firms*

Protagonists have applied different priori classifications to distinguish FC and unconstrained firms. Kaplan and Zingales (1997) found results contrary to that of FHP (1988). Their arguments have been supported by Cleary<sup>(4)</sup> (1999) and Almeida and Campello (2002), who found that the investment of more constrained firms was less sensitive to changes in internal cash flows. Both quantitative and qualitative data were employed.

KZ (1997) used rich qualitative information collected from the disclosure filings of firms in order to directly categorise firms as financially constrained. Firms were classified as FC if they were in violation of debt covenants, not benefiting from their usual source of credit, irregular in terms of debt repayments and facing difficulties due to liquidity problems.

Lamont et al. (2001) employed the KZ sample and estimated an ordered logit model to directly categorise firms as financially constrained. The variables used by these authors were: Leverage, Tobin's Q; Cash Flow, Cash Levels and Dividends.

Yet, the methodology of KZ was severely criticized because the coefficients may vary across different samples, biasness in some relationships and the use of unproductive variables. Fazzari et al. (2000) replied to KZ (1997) by arguing that the methodology used by the latter and Cleary (1999) was biased since they ended up with treating financially distressed firms as being financially constrained.

In a study of some African countries, Bigsten et al. (2003) used data from firms in the manufacturing sector from six countries, namely cote D'Ivoire, Burundi, Cameroon, Ghana, Zimbabwe and Kenya over the period 1992 to 1996 in order to investigate whether these firms were financially constrained. It was tested whether firms had a demand for credit and whether access to these resources were easy when needed. A Probit model was applied in a panel data structure and the results showed that only a quarter of the firms could obtain easy access to finance from the market. Only those firms with good banking ties could obtain further credit.

Beck et al. (2006) uncovered that countries with higher levels of financial sector development, more efficient legal systems, more liquid stock market and higher level of GDP per capita had fewer obstacles in obtaining external finance. Bougheas et al. (2006) conducted their study in the UK manufacturing firm between 1989 and 1999 and found that several variables affected access to debt financing. These include collateral, age, profitability, riskiness and size which influence accessibility of debt financing.

Recently, Hadlock and Pierce (2010) used qualitative information to categorise FC of firms for a random sample of 407 US firms from 1995 to 2004. They estimated an ordered logit model, which predicted FC as a function of different quantitative factors. The results so obtained were in contradiction of those obtained by KZ (1997) and they found that firm size and age were useful predictors of FC levels. Hence, they proposed a measure of FC based solely on firm characteristics.

Carreira and Silva (2012) estimated the extent to which R&D investment and innovation were financially constrained for Portuguese firms over the period 1996-2004. They also identified the main determinants of FC by estimating different models as well as cash to cash flow sensitivities using a unique data set for companies that comprise information on firm characteristics, balance sheet information and data on firm's innovation activity.

The results confirmed that firms that did not invest in R&D and which did not receive public funding were financially constrained. Further results obtained indicated that FC was explained by size and cash flow but not by age of the firm. After controlling for endogeneity, it was found that FC reduced the amount invested in R&D to a great extent. To this end, an ordered Probit model was also estimated.

#### *(ii) FC in firm level Surveys*

Kounouwewa and Chao (2011) analysed the determinants of FC in African countries by using survey data on 1,559 firms over the period 2002 to 2005 for 16 countries. Size and firm ownership were used a priori criteria for distinguishing between financially constrained and unconstrained firms. The results found that institutional development was the most important determinant that explained cross-country variations in firm's financial obstacles. A Probit model of both small and medium enterprises was used to estimate regressions.

Savignac (2008) examined the impact of FC on firms and a direct measure of FC was obtained from a survey result in some French established firms. FC was found to significantly decrease the probability of innovation by firms.

Bonnet et al. (2005) investigated FC at regional level in the French areas by employing firm level survey data on 30,778 French firms conducted between 1994 and 1997. The difference in the FC of firms was analysed with logit models and the probability of the firms to be financially constrained in different sub-samples was estimated. Moreover, four modalities of FC were distinguished and analysed. Results showed the existence of financial constraints at firm level.

Recently, Kira (2013) used a sample of 1,933 manufacturing and services sector firms located within the 5 East African Countries (Burundi, Kenya, Rwanda, Tanzania, Uganda) with economic integration and data from the World Bank Enterprise Survey in order to determine the determinants of financial obstacles of firms. Using data collected from over 10,000 firms over the period 2002-2007, an ordered Probit model as well as a multivariate regression model to detect FC, it was found nearly all firms were financially constrained, and was more acute for SMEs sole traders and partnerships.

At the European Union level, Canton et al. (2010) carried a survey on the determinants of access to finance for SMEs and found out that firm's age, bank relationship, and industry competition were the determinants of firm's perceived financial constraints in banking industry. The results were valid across many industries.

### *(iii) Index of FC*

For a direct measurement of FC of firms, Lamont et al. (2001) constructed indices (both time and country specific) by extending the insights used by KZ (1997). They applied an ordered logit regression of FC on some relevant determinants of FC.

Whited and Wu (2006) constructed the WW index of FC which did not require any qualitative information but instead used the shadow cost of equity finance to obtain a vector of coefficients. The index, which was based on balance sheet data to shadow the shadow cost of external finance, was a linear combination of six empirical factors namely cash flow, a dividend payer dummy, leverage, firm size, industry sales growth and firm sales growth.

Whited (1992) used measures of indebtedness, interest coverage and bond rating to distinguish the FC of firms. Cleary (1999) adopted FC index, which was composed of liquidity, leverage, profitability and growth.

### **3.3. Critical appraisal of current literature**

In the above section, the alternative measures and determinants of FC have been reviewed and classified between both direct and indirect indicators. It is seen that research on these issues have been undertaken both in some cross-country studies as well as in some specific contexts, including some African countries. Most research has been conducted in the largest and developed economies such as UK and US, Canada, Italy, Japan, Germany, EU countries and the French areas. An analysis of the literature unveils the following extra critics:

- Up till now, there has been only a limited amount of research on the measurement and determination of FC (e.g., FHP, 1988; KZ, 1997, 2000). There is still a void in the literature concerning results in emerging economies like Mauritius.
- The majority of results available have mainly focused on the indirect measures of FC (e.g., FHP, 1988; KZ, 1997), with little evidence available on direct measurements of same and no conclusive evidence. FHP (1988) did attempt to proxy FC but did not measure it explicitly. They have used the concept of internal funds (retention) and the I/CF sensitivity to only **proxy** FC.
- Moreover, the relative merits of the alternative approaches adopted by them to assess and measure FC have been questioned and severely criticized (see Huafeng and Shaajun, 2012 for an extensive analysis).

- Some authors have concluded on FC without making any empirical investigation/modelling. Alternative theoretical backgrounds have been adopted with no robust and established theory in the literature. There is a need for direct evidence on FC undertaken in both surveys and applied econometric modelling.
- The other authors (KZ and WW) have computed a measure of FC but missed a number of pertinent variables affecting the FC of firms. They based themselves on a priori classification, which can be unproductive in terms of policy making. They have used only balance sheet data, whereas in fact, FC may also be dependent on a number of other external factors.
- Also, in most cases, time series data and cross-sectional analysis of data have been employed. Further results are thus needed for the case of Mauritius and there is also the need to apply other methods such as advanced econometrics studies and further sensitivity analysis are merited.
- Most studies have estimated empirical Q equations. Robustness tests are thus needed with results obtained from alternative investment models. Very few studies exist that directly test the impact of financial policies (such as FL and FSD).
- Most studies have concentrated on firms in the manufacturing sector and there is need to provide sensitivity of results in other economic sectors than the manufacturing sector.

### 3.4. Contribution of the present study

The present study supplements to the existing empirical literature in the following ways:

Given that FC is a variable that is not directly observable or available on the balance sheet, we extend the literature on FC and provide evidence on variables that directly measure the FC in a well-defined sample of Mauritian enterprises. These are:

- Firms' dividend payment behaviour and perceptions on same; forms of dividend payments and policies adopted;
- Preferred choice for financing long term projects and
- Financing difficulties of firms & the sources of finance used.

## 4. Methodological issues

### 4.1. Research method chosen

#### *A deductive approach to financial constraints*

A deductive approach is adopted to measure the financial constraints of firms. To this end, a quantitative strategy is adopted. Data from a stratified sample of the top 100 companies as well as a unique firm level survey data obtained from a sample of 300 SMEs via simple random sampling are used.

Results obtained from these samples serve the purpose of the research given that firms from two different extremes are studied as follows: the top largest 100 firms and the SME's. The top 100 firms are those with high asset values and financial position. They mainly belong to group structures and operate internal financial markets amongst sister companies. Hence, FC is expected to be low for such companies. In contrast, SMEs are basically small and medium enterprises and can be characterized as having difficult access to financial markets caused by excessive cost of finance due to asymmetric information and moral hazard.

### 4.2. The sampling design and sample definition

In this study the population will be the companies under consideration in Mauritius. The top 100 largest companies as well as 300 SME's are surveyed. To select the top 100 companies, a stratified sampling procedure has been used, based on turnover. The classification is already

available in a magazine entitled “top 100 companies in Mauritius”. The entire 100 large companies have been surveyed.

To select the 300 SME's, a simple random sampling procedure has been adopted. Information on these companies has been received from the website of SMEDA and a simple random sampling through selection by the computer has been ensured.

The probability sampling technique was used so that everyone is given the chance and not only a specific group is targeted. Different ways can be used to select a probability sample, but for this study the random sampling was used as it is free of bias and it gave each unit of the population a calculable and non-zero chance of being selected.

#### **4.3. Use and design of questionnaire**

The use of a questionnaire is more efficient in quantitative research because it contains various possible responses to a set of pre-determined questions. As such, more companies can be targeted at a much lower cost via the use of a questionnaire. Moreover, there are a number of sophisticated statistical packages such as SPSS via which survey results can be analysed with a high degree of confidence, security<sup>(5)</sup>, validity and reliability tests. The aims and objectives of a survey and the main variables to be addressed are crucial elements for the effective design of a questionnaire.

For the present research, the questions addressed in this study are based on the available literature in this area (see chapter two and three for a review of literature on FC). Hence, the questionnaire is developed to directly address the goals of the study. It has been designed with a mix of different types of questions namely multiple-choice questions (a multiple response scale allowing to select one or several alternatives), open-ended questions (the respondent is free to give any reply appropriate to him), dichotomous questions (where there are two options, usually ‘yes’ or ‘no’) and questions where the respondent can provide a rating of some elements.

#### **4.4. Distribution of questionnaire**

As already mentioned, the addresses of the top 100 companies were readily available in a publication. For the selection of SMEs, companies were selected from the five parts of the island and questionnaires were sent to them, after a phone call. Where it has been impossible to contact certain companies through telephone, forms were sent via e-mail prior to their approval.

### **5. Interpretation of data and reliability tests**

Survey results are reliable and can be used for policy prescriptions only when they pass some reliability tests. For the purpose of this research, the internal reliability is tested with Cronbach's Alpha, which measures the correlation between the variables that attempt to determine a concept. The correlation within the different factors will be measured, in other words, how the different statements that treat a factor correlate with each other.

The Cronbach's Alpha test shows a value between 0 and 1, where 1 means a perfect correlation, and 0 no correlation at all. The lowest acceptable limit for a reliability test with the Cronbach's Alpha method is 0.7. Hence the level should be over 0.8 to be accepted.

In a similar manner, we use the Guttman Split-Half coefficient to reinforce reliability of our results. This coefficient should be similar to that of the Cronbach's Alpha because it is simply the latter's coefficient when the sample is split into different sub-samples. In other words, it is the Cronbach's Alpha that would result if two halves of the sample is treated as two different items.

In order to test for the existence of any form of relationship between two variables, we use the  $\chi^2$  test and high values of same denote existence of a relationship.<sup>(6)</sup>

After collecting the questionnaires, the data had to be processed before being presented in an understandable manner. It involved editing, coding and checking for completeness after all questionnaires were filled. These qualitative data were converted into quantitative data where they were transformed into symbols and numerals for tabulation and counting.

### **5.1. Data encoding and reporting**

Before processing the data, they have to be coded and edited. The data were inputted into the SPSS (Statistical Package for Social Sciences) software, version 17.0 for analysis and statistical inferences. For this study, both uni-variable and bi-variable analyses were carried out. Microsoft Excel 2007 was also used to present some information. Although the majority of the questions set were pre-coded, there were quite a few data items pertaining to open-ended questions that needed to be coded before input of data could start. Upon completion of the coding exercise, data entry operation started.

### **5.2. Pilot study**

A pilot study was undertaken before the final formal data collection process was to be carried out. This was done in order to ensure that the question was appropriately framed in order to acquire the required data and also to ensure if some words used in the questionnaire were complex to understand. The pilot study revealed no major flaws in the proposed questionnaire and it was subsequently accepted to proceed with the data collection.

### **5.3. Analysis of results**

#### **5.3.1. Survey results from top 100 largest companies**

##### **Dividend payment behaviour and perceptions on same**

In this section, the hypothesis is that FC can be analysed through the dividend behaviour of firms as well as their perceptions on same. For this purpose, we surveyed the pattern of dividend payment among the top 100 companies. Several questions were asked to managers and the results are conveyed in table 1 below.

Managers were queried whether they perceive investment and dividend decisions to be inter-connected and all of them responded in the affirmative (100% response rate). Hence, they look at investment opportunities prior to declaration of dividends. If the company makes profits, they prefer to curtail dividend payments in the current period in order to have the available financial resources for investment in profitable ventures. They believe that shareholders can or prefer to wait to have a greater amount of dividend resulting from the profitable venture. An investment decision is thus done simultaneously with a dividend payment decision.

The above results can be confirmed by the other results obtained whereby 69% of managers stated that they cut dividends when the company's prospects are poor in order to adjust for financing of current investment projects. This can be interpreted as a preliminary sign of the existence of FC amongst firms where access to external financing is difficult and costly. Firms are thus obliged to resort to internal financing (the cheapest mode), as predicted by the POH.

To confirm this result, 75% of managers reported that they would raise dividend only if they feel that the company would be able to sustain the increase in the future. They thus regard their cash flow as crucial determinants of investment and prefer not to raise dividend payments in case the company's prospects are poor in order to adjust for investment projects.

These results instantaneously confirm that the largest firms follow the residual theory of dividend payment, that is, they base their dividend payment decision on the amount of

financial resources available, after profitable investments have been made. This is also in line with the Investment-Consumption model and the Walter's (1963) Dividend Relevance model. By and large, the results also indicate the existence of FC amongst these firms.

Moreover, 75% of the managers reported that uncertainty/volatility of a firm's future earnings is reflected in reduced dividend payout in the current period while 84% indicated that firms with high growth prefer to cut current dividend payments. Hence, as a precautionary measure, when firms have no visibility on their future prospects, they cut current dividend payments to retain cash resources in the company. Most of them retain cash to sustain future growth strategies of the firms.

The survey results also reveal that most companies (97%) agree that they have inside and better information about the future prospects of the firm than outside stakeholders. They are thus in a better position to understand and apprise the decisions made by the companies. This result provides an important insight to also understand the behaviour of outside shareholders of the company. The latter possess asymmetric information vis-à-vis inside stakeholders about the company's prospects and may thus require a higher premium in terms of dividend payments or they may rather oppose a dividend curtailment of the company.

Shareholders thus follow the Bird-in the hand theory of dividend proposed by Lintner (1962). They prefer to obtain cash dividend payments rather than waiting for the future. Moreover, there may be conflict between inside and outside stakeholders, thereby rendering the decision making process of firms difficult.

Most of the managers (90%) also mentioned that, in conglomerate group structures, the dividend policy of each subsidiary, which itself may be publicly listed, is often determined by the holding company. It is also based on the cash needs of other companies in the group. Thus, the decision to retain cash is not only based on the individual firm, but also on the amount of investments needed by other firms in the group structure. These firms rely on each other for funding of projects.

This result can be interpreted as follows: First, as already discussed, the dividend payment of a firm is also dependent on the cash needs of other firms in the group. Secondly, these corporations have an internal financial market, that is, those in need of funds obtain their capital from their counterparts in the group having an excess finance. All these together reinforce the hypothesis that firms are financially restricted, that can be explained by costly external finance.

**Table 1.** *Firms' perceptions on dividend payment*

Financial variable of relevance to study	Number of respondents	Percentage (%)
Number of firms that perceive investment and dividend decisions to be interconnected.	100	100
Number of firms having inside and better information about the future prospects of the firm than outside stakeholders.	97	97
Number of firms that cut dividends when the company's prospects are poor in order to adjust for financing of current projects.	69	69
Number of firms that would raise dividend only if they feel that the company would be able to sustain the increase in the future.	75	75
In conglomerate structures, the dividend policy of each subsidiary, which itself may be publicly listed, is often determined by the main company.	90	90
Uncertainty/volatility of a firm's future earnings is reflected in reduced dividend payout.	75	75
Firms with high growth prefer to cut current period dividends payments.	84	84
Firms with good investment projects prefer to plough back profits.	84	84

**Source:** Survey results.

The following table provides the two main reliability tests of the survey, namely the CA coefficient and the Guttman Split-Half Coefficient. Given a CA coefficient greater than seven, results from the survey are deemed to be reliable. To confirm such an analysis, the Guttman Split-Half Coefficient and it has a value of 0.756, implying that the survey is reliable even if it



was conducted twice with the same questions and same respondents but in two separate samples (same sample split into two halves).

**Table 2.** *Reliability tests of survey results*

Cronbach's Alpha (CA)	Guttman Split-Half Coefficient	No of Items
0.782	0.779	8

Source: SPSS results.

It is seen that firms basically prefer to curtail dividends payments in order to finance investment projects and are thus financially constrained. Moreover, those in group structures prefer to operate an internal financial market to finance investment projects. In the following part, the forms of dividend payments adopted by firms are analysed in order to infer on the extent of FC faced by them.

### Forms of dividend payments

The forms of dividend payment adopted by the largest firms can also be indication of the existence of FC. As such, this variable was surveyed amongst firms and the results are reported in table 3 and 5 below. The reliability tests of these results are provided in tables 5 and 6 respectively. The different forms of dividend payments mainly include cash payments, bonus issues, shares repurchase transactions and others. Firms were also requested to indicate the other types of dividend policies adopted by their firms.

**Table 3.** *Forms of dividend payment*

Forms of dividend payments	Number of firms	Percentage
Cash	15	15
Bonus	78	78
Share Repurchase	5	5
Others	2	2
Total	100	100

Source: Survey.

**Table 4.** *Reliability tests of survey results*

Cronbach's Alpha (CA)	Guttman Split-Half Coefficient	No of Items
0.721	0.713	4

Source: SPSS results.

**Table 5.** *Other types of dividend policies adopted by companies*

Common dividend Policy	Number of companies	Percentage
Constant dividend rate with increases in three years or so	23	23
Dividend payment based on earnings, cash availability and capital expenditure budget for the following year	59	59
Substantially all investment income as dividends	13	13
Others	5	5
Total	100	100

Source: Survey.

**Table 6.** *Reliability tests of survey results*

Cronbach's Alpha (CA)	Guttman Split-Half Coefficient	No of Items
0.742	0.738	4

Source: SPSS results.

Based on the above results, the three main forms of dividend payments adopted by firms include cash payments (15%), bonus issues (78%), share repurchase (5%), and other forms (2%). It is observed that most firms opt for bonus issue of shares. This is advantageous to them in the sense that they can plough back the profits realized in the current year and use same to build on liquidity for investment purposes.

Given the likely conflict that may arise from shareholders because of asymmetric information, companies prefer to give bonuses to payment of dividends in the future when there are higher cash resources. Shareholders are compensated with a promise of greater dividend amounts in

the future. With this strategy, firms retain more funds to finance current investment problems. These results also indicate the inter connection between firms' dividend, investment and demand for internal finance.

When the firms were surveyed on the common dividend policy adapted, the results indicate that 23% of them have a constant dividend rate with increases in three years or so, 59% have a dividend payment based on earnings, cash availability and capital expenditure budget for the following year, 13% of these firms have substantially all of their investment income as dividends while 5% indicated that they adopt other forms of dividend policies.

These results confirm the earlier analysis that most firms pay dividends based on their earnings, cash resources available and amount of cash left after budgeting for capital expenditure. Moreover, only 23% of the firms had a constant dividend rate with increases in the rate after three years. These results reinforce the hypothesis that companies are thus financially constraint and they resort to internal financing by opting not to distribute dividends in the current period. They invest the profits and defer these payments by offering incentives like bonus issues.

The Survey results from both tables 3 and 5 are deemed reliable with a CA and GSC of greater than 0.7. The present analysis is augmented by performing a cross tabulation as reported in table 7 below.

*Cross tabulation: Forms of dividend payments/policies and payment patterns*

**Table 7.** *Forms of dividend payment and payment patterns*

Frequency of dividend payments/→→→→→→→→→→	Always	Often	Sometimes	Rarely
Forms of dividend payments↓↓↓				
Cash	3	32		
Bonus	45	10	3	
Share Repurchase			5	
Others				7
Constant dividend rate with increases in three years or so		10	13	
Dividend payment based on earnings, cash availability and capital expenditure budget for the following year	59			
Substantially all investment income as dividends			13	
Chi-Square test statistic ( $\chi^2$ )	12.38			

**Source:** SPSS.

Results from a cross tabulation between the forms of dividend payments and the frequency or pattern of such payment is made in table 7 above. It indicates that for cash dividend payments, only 3 firms always do so while 32 of them often make such types of payments. For bonus issues, 45 firms always do so, 10 often and only three sometimes, reinforcing the analysis that most firms prefer bonus issues.

As far as share repurchase is concerned, only five firms do so and that also sometimes. Those firms having a constant dividend policy do so often (10 firms) or even now and then (13 firms). Those who responded that they have all investments income as dividends do so only sometimes, while those having dividend payments based on earnings, cash availability and capital expenditure budget (59) always do so. These are additional evidence that firms are financially constrained. A high  $\chi^2$  value of 12.38 indicates that there is association between the two parameters analysed.

We can argue that the statements in this section have served their purpose and have revealed the things upon which we wanted to obtain answers. That is, the FC of firms can be analysed through the dividend payment behaviour of the firm. It is seen that firms normally curtail dividend payments to finance investment projects. In the next section, we analyse the results on the preferred choice of financing long-term projects.

### Preferred choice for financing long-term projects

In this segment, we determine the FC of firms by analyzing the company financing priorities. As per the POH, firms resort to internal financing when there is costly external financing in the market.

In the survey conducted, companies were requested to indicate their choice between ordinary shares, debentures and loans. The result is presented in the following table below:

**Table 8.** *Forms of financing*

Forms of financing	Number of firms	Percentage
Ordinary shares	81	81
Debentures	15	15
Loans	4	4
Cronbach's Alpha (CA)	0.82	

**Source:** Survey.

81% expressed preference for ordinary shares, 15% for debentures while only 4% prefer to opt for loan instruments. Such companies prefer shares because they view dividend payments cheaper than interest payments and because they are less costly than a debenture issue. Moreover, a share issue does not decrease the company's gearing, which is the proportion of fixed interest securities to capital employed. High gearing may increase the bankruptcy risk of a company if not properly managed. Equity is the most flexible source of finance.

Companies were also asked to rank in order of priorities their choice for the sources of financing that they normally utilize in order to finance their investment. A cross tabulation between the choice of financing modes and use in terms of priority is given in table 9 below:

**Table 9.** *Cross tabulation between companies financing priorities and payment patterns*

Financing choices→→→→→ Priority↓↓↓	Retained earnings	Ordinary shares	Debentures and loans
First	75%	18.75%	6.25%
Second	18.75%	75%	18.75%
Third	6.52%	6.25%	75%
Total	100%	100%	100%
Chi-Square test statistic ( $\chi^2$ )	9.62		

**Source:** Survey.

It can be observed that retained profits are the first priority, share issue as the second choice of companies while debt issuance the third priority. 75% of the companies viewed retained earnings as their first choice, 18.75 as their second choice and 6.25 as their third choice. Only 6.25% of the companies consider debt as their first choice, 18.75 as their second choice and 75% as their last choice.

Therefore, so long that company has large amount of retained earnings, they prefer to utilize it, rather than the other mode of finance, in line with the POH. Moreover, this is regarded as the cheapest source of finance. For ordinary shares, 18.75% of firms have it as a used as first priority, 75% as their second priority and only 6.25% as their third priority. Results from the cross table is reinforced with a Chi-square value of 9.62, implying that there is association between the different variables studied.

Despite the fact that debts are more expensive to service over long term, some companies choose debt financing because it is much easier to find in the market – either through loans or via fixed income securities like debentures. In addition, there is much unwillingness of local investors to invest in shares while many corporations find it difficult in primary issue of shares. There is also a very poor liquidity on the SEM. People prefer alternative sources of saving their money and the growing number of bank deposits may explain this.

Shaw (1973) asserted that due to market imperfections such as high cost of issuance and inflation, there will continue be hindrances in the development of the stock market, as is the

case in Mauritius. According to Stiglitz (1986), even if the credit markets are liberalized, information asymmetry between financial intermediaries and borrowers of finance/companies, the market rate of interest may not allocate credit efficiently. Poor disclosure practices by corporate may hinder the proper valuation of business and credit risk. This leads to potential errors and inherent weaknesses in the pricing of financial assets such as equities, debentures and bank loans.

In this part, it is seen that firms prefer ordinary shares to debts. However, they have a greater preference for retained earnings which is the cheapest mode of financing available. Hence, firms are financially constrained since they rely on internal financing.

In the next section, the different sources of finances for the largest firms as well as the financial difficulties faced are analysed.

### Financial difficulties of firms and sources of finance

In order to determine the extent of FC of firms, they were requested whether they face financial problems and difficulties in obtaining financing for their projects. The results obtained from the survey are as follows and reported in table 10, which is a cross tabulation between “firms having financial problems and their corporate structure.”

Out of the 100 firms surveyed, 68% face difficulties in raising finance while 32% do not face such problems. A CA coefficient of 0.80 confirms reliability of the survey undertaken. For a much deeper analysis, the extent of financial difficulties faced by the firms in the different group structure was also surveyed.

Out of the firms that have financial problems, 50% are locally owned, 18% are foreign subsidiaries, 22% are family owned business while 10% are in corporate groups. Hence, local firms face more problems than those in other forms of corporate structure. Those in larger corporate group operate an internal financial market where those in need of financing can easily access it from the excess reserves of other companies within the group. 22% of firms facing financial problems are family-owned.

This is indeed a pertinent issue that may be linked to the corporate governance structure of these firms. Family-owned companies tend to have bad corporate governance arrangements, which may lead to financial problems. A good association between the variables studied exists as denoted by the  $\chi^2$  value of 10.36. Moreover, the CA coefficient of 0.80 indicates reliability of the statistics obtained from the survey. More firms face financial difficulties, implying that they do not have easy access to financial resources in the external market, a direct indication of financial constraints.

**Table 10.** Cross Tabulation: Firms having financial problems and corporate structure

Financial problems	Number of firms	% locally owned	% Foreign - owned	% Family owned	% in corporate group relationship	Total
Yes	68	50	18	22	10	100%
No	32	16	20	7	57	100%
Total	100					
Cronbach's Alpha (CA)	0.80					
Chi-Square test statistic ( $\chi^2$ )	10.36					

Source: Survey.

The companies surveyed were also requested to indicate the sources of finance employed in project financing and the results are produced in table 11 below. The latter is a cross tabulation between “the sources of finance and the forms of corporate structures.” It is seen that 58 firms use internal financing, 38 seek loans from banks while 4 indicated that they have other sources of finance. Of those firms using internal finance, 38% are foreign-owned firms while 62% of them are locally owned. However, 82% of them belong to a corporate group structure and therefore another one in the same group may use the finance of one company. Hence, firms are seen to be financially constrained by a greater usage of internal financing as

compared to external financing. The hypothesis that most groups operate an internal financial market is reinforced.

**Table 11.** *Sources of finance used & accessed by companies and corporate structures*

Sources of finance	Number of firms	% Locally owned	% Foreign -owned	% in corporate group relationship
Use of internal financing	58	62	38	82
Use of loans from banks	38	45	55	54
Other sources	4	4	82	14
Total	100	100	100	100
Cronbach's Alpha (CA)	0.78			
Chi-Square test statistic ( $\chi^2$ )	13.24			

**Source:** Survey.

It is seen that firms are financially constrained, as indicated by the financial difficulties they face as well as sources of finance employed. They mostly employ internal financing, especially those in corporate groups. Hence, even the largest firms face FC. In the next part of the Paper, we survey the results from a sample of 300 SMEs across the different sectors of the economy.

### 5.3.2. Survey results from 300 small and medium enterprises

A similar questionnaire that was used for the top 100 companies was adopted and the same methodology employed for the survey. The different results are reported and interpreted in the following paragraphs:

#### Dividend payment behaviour and perceptions on same

The pattern of dividend payment among 300 SMEs was surveyed. A response of 294 firms was received. Similarly to what was done for the top 100 companies, several questions were asked to the SME's and the results reported in table 12 below.

Managers were asked whether they perceive investment and dividend decisions to be interconnected and 85% of them responded in the affirmative, in contrast to a 100% response rate from the largest firms. This can be explained by the fact that some SMEs are mostly loss making and hence do not declare dividends. Yet, the majority of them can be regarded as financially constrained as they make investment decisions together with a decision of dividend payment or not.

88% of these firms agree that they have inside and better information than outside stakeholders of the company, in contrast to a 97% response rate from the largest firms. The problem of agency is thus more acute in the largest firms than in the SMEs. This is because information is easily accessible or shared by these small and medium sized firms.

96% of the SME's surveyed indicated that they cut dividend payments when the company's prospects are poor in order to adjust for current project financing, in contrast to 69% of the largest firms. SMEs are generally more financially constrained and they therefore cut dividend payments in order to have enough financial resources to fund current projects.

This is reinforced by 76% of the SME's, which responded that they would raise dividend only if they feel that the company would be able to sustain the increase in the future. 88% of the SME's reported that uncertainty/volatility of a firm's future earnings is reflected in reduced dividend payout while 84% responded that firms with high growth prefer to cut current period dividends payments, and 91% responded that those having feasible investment ventures prefer to plough back profits.

These statistics were also high for the largest firms, implying that the SMEs are financially constrained and resort to internal financing. Such an analysis is further reinforced by 94% of the SMEs which responded that in conglomerate structures, the dividend policy of each

subsidiary is often determined by the holding company. One firm in the SME group finances its investment from finances available in the other SME in the same group.

**Table 12.** *Firms' perceptions on dividend payment*

Financial variable of relevance to study	Number of respondents	Percentage
Number of firms that perceive investment and dividend decisions to be interconnected	251	85
Number of firms having inside and better information about the future prospects of the firm than outside stakeholders	259	88
Number of firms that cut dividends when the company's prospects are poor in order to adjust for financing of current projects	285	96
Number of firms that would raise dividend only if they feel that the company would be able to sustain the increase in the future.	224	76
In conglomerate structures, the dividend policy of each subsidiary is often determined by the holding company.	275	94
Uncertainty/volatility of a firm's future earnings is reflected in reduced dividend payout	260	88
Firms with high growth prefer to cut current period dividends payments	248	84
Firms with good investment projects prefer to plough back profits	268	91

**Source:** Survey results.

By looking at Cronbach's Alpha of 0.776 as well as Split-Half Coefficient of 0.769, the survey results are deemed to be reliable. In this section, it is seen that SMEs are financially constrained as indicated by their reliance of internal funds in contrast to external funds, operation of an internal financial market for those in group structure and investment and dividend decision being jointly determined. It is seen that firms cut dividends in order to adjust for the financing requirements of the firm. In the next section, the forms of dividend payments as well as the types of dividend policies adopted is analysed.

**Table 13.** *Reliability tests of survey*

Cronbach's Alpha (CA)	Guttman Split-Half Coefficient	No of Items
0.776	0.769	8

**Source:** Survey results.

### *Forms of dividend payments by SMEs*

Compared to the results obtained for the top 100 companies, the form of dividend payout for the 300 SMEs surveyed is totally from cash. Looking at the other types of dividend policies adopted by the SMEs, it is noted that 78% is based on Dividend payment based on earnings, cash availability and capital expenditure budget for the following year, representing 228 companies, 12% is based on constant dividend rate with increases in three years or so, representing 35 companies and 12.33% is based on substantially all investment income as dividends, representing 37 companies. These are further detailed in the following tables.

**Table 14.** *Forms of dividend payments*

Forms of dividend payments	Number of SMEs	Percentage
Cash	297	100
Bonus	0	0
Share Repurchase	0	0
Others	0	0

**Source:** Survey.

**Table 15.** *Reliability tests*

Cronbach's Alpha (CA)	Guttman Split-Half Coefficient	No of Items
0.837	0.828	4

The survey results in table 14 are deemed reliable as indicated by both the CA coefficient and the SHC.

**Table 16.** *Other types of dividend policies adopted by the SMEs*

Common dividend Policy	Number of companies	Percentage
Constant dividend rate with increases in three years or so	35	12
Dividend payment based on earnings, cash availability and capital expenditure budget for the following year	228	78
Substantially all investment income as dividends	37	13
Others	0	0

Source: Survey.

**Table 17.** *Reliability test*

Cronbach's Alpha (CA)	Guttman Split-Half Coefficient	No of Items
0.837	0.828	4

Source: Survey.

The results in the above table indicate that most firms are financially constrained since their dividend payments are based on earnings, cash availability and capital expenditure budget for the following year. Very few of them have a constant dividend rate policy due to uncertainty and volatility of earnings for SMEs. SMEs having substantially all investment income as dividends may not have adequate investment skills or take all earnings as dividends, which represent their salaries. By looking at Cronbach's Alpha, the survey is deemed to be reliable. The analysis is reinforced with the following cross tabulation between the forms of dividend payments and the payment patterns.

*Cross tabulation: Forms of dividend payments/policies and payment patterns*

**Table 18.** *Forms of dividend payment and payment patterns*

Frequency of dividend payments/→→→→→→→→→→	Always	Often	Sometimes	Rarely	Never
Forms of dividend payments↓↓↓					
Cash				300	
Bonus					0
Share Repurchase					0
Others					0
Chi-Square test statistic ( $\chi^2$ )	8.54				

Source: Survey.

It is observed that those SMEs that have a cash dividend policy do not do so frequently. This implies that cash resources are rarely available to pay dividends. Instead, it is ploughed back for future use in the business. This reinforces the hypothesis that SMEs are financially constrained.

The results of the preferred choice of financing adopted by SMEs for long-term projects are analysed. The cross tabulation result indicates that there is an association between the form of dividend payments as well as the pattern of such payments, as indicated by the chi-square value of 8.54.

### Preferred choice for financing long-term projects

In the survey conducted, companies were requested to indicate their choice between ordinary shares, debentures and loans. There is no expressed preference for ordinary shares and only 3% for debts. Such companies prefer retained earnings, which represents 97% as they face difficulty in accessing finance as they have no collaterals to offer. The results are illustrated in the following table and cross tabulation:

**Table 19.** *Forms of financing*

Forms of financing	Number of firms	Percentage
Ordinary shares	0	0
Loans and debentures	8	3
Retained earnings	286	97
Cronbach's Alpha (CA)	7.65	

Source: Survey.

**Table 20.** *Cross tabulation between financing choices priority and sources of finance*

Financing choices→→→→→ Priority↓↓↓	Retained earnings	Ordinary shares	Debentures and loans
First	265		
Second	21		1
Third	0		7
Total			
Chi-Square test statistic ( $\chi^2$ )	11.35		

Source: Survey.

It can be observed that retained profits are the first priority, debentures and loans as the second choice of the SMEs. 265 companies viewed retained earnings as their first choice as they face difficulty in accessing debentures and loans given their magnitude of their assets and the fact that they have little to give in terms of collateral. Only 21 SMEs which used retained earnings as a source of finance use same as a second priority only. Those SMEs who use loans and debentures, only one firm indicated this as a second choice while 7 firms use loans and debentures as their third priority.

Moreover, there is much unwillingness of local investors to invest in shares of small companies deemed to be very risky. There is also a very poor liquidity on the SEM. People prefer alternative sources of saving their money and the growing number of bank deposits may explain this.

These results culminate the fact that the SMEs follow a hierarchy of finance where retained earnings in the first choice, followed by debts and debentures, in line with the POH. The results are similar to those obtained for the largest firms, that is, SMEs prefer internal financing such as retained earnings. However, SMEs are more financially constrained than the large firms since the survey results that some large firms do use loans and debentures. This may be explained by their size and collateral that they may offer to financial institutions.

In the next section, the results from the financial difficulties of firms and the sources of finance employed are reported.

### Financial difficulties of firms and sources of finance

Firms surveyed were requested whether they face financial problems and whether they face difficulties in obtaining financing for their projects. Out of the 294 firms surveyed, 96% face troubles in raising finance while 4% do not face such problems.

Most of the SMEs (55%) who face financial problems are locally owned while 35% are family owned. The latter implies that even those operating under family owned enterprises lack collateral security to offer and thus have problems in obtaining finance. Only 5% of the SMEs which are in corporate group structure and those which are foreign owned face financial difficulties. The results are provided in table 21 below.

In contrast, those firms that do not face financial difficulties are mostly found in a group structure. They operate an internal financial market and those with excess cash resources finance profitable projects for firms in the same group. These results are reported in the following cross tabulation between whether firms face financial problems or not and their structure. The reliability tests are acceptable with a good chi square value of 12.35 as well as a CA coefficient of 0.773.

**Table 21.** *Firms having financial problems and corporate structure*

Financial problems	Number of firms	% locally owned	% Foreign -owned	% Family owned	% in corporate group relationship	Total
Yes	283	55	5	35	5	100%
No	11	5	5	5	85	100%
Total						
Cronbach's Alpha (CA)	0.773					
Chi-Square test statistic ( $\chi^2$ )	12.35					

Source: Survey.



Companies were requested to indicate the sources of finance employed in project financing and the results are produced in table 22 below which is a cross tabulation between the sources of finance used and corporate structure. It was found that 287 firms use internal financing, 7 seek loans from banks. Of those firms using internal finance, 20% are family-owned firms while 75% of them are locally owned. However, 5% of them belong to a corporate group structure and therefore another one in the same group may use the finance of one company. For those companies who use loans from banks, 85% are locally based companies, 13% are foreign owned while 2% are in corporate group structure.

The results found in this section indicate that most firms, especially those who are locally owned use internal financing and are financially constrained. In contrast, those in group structure and which are foreign owned use less internal financing as they may easily obtain financing from their counterparts in the group. Both the CA coefficient of 0.851 and the Chi-square value of 11.65 are acceptable.

**Table 22.** *Sources of finance used and accessed by companies*

Sources of finance	Number of firms	% Locally owned	% Foreign -owned	% in corporate group relationship
Use of internal financing	287	75%	20%	5%
Use of loans from banks	7	85%	13%	2%
Other sources				
Total	100	100	100	100
Cronbach's Alpha (CA)	0.851			
Chi-Square test statistic ( $\chi^2$ )	11.65			

**Source:** Survey.

A similar pattern of results were obtained for the largest firms in part A whereby the local firms face more financial problems than those which are either foreign owned or are in group structure. Moreover, most of them use internal financing, especially those who are in group structures.

## 6. Conclusion

The results obtained are different from the surveys conducted by Kounouwewa and Chao (2011), Savignac (2009), Bonnet et al. (2005), Kira (2013) and Canton et al. (2010) since these authors have used different approaches to measure FC.

This Paper has attempted to supplement the existing results available in the literature on the measurement of financial constraints in an emerging economy like Mauritius. A direct attempt has been made to study the FC of both the largest firms and the SMEs via their dividend payment behaviour, policies and perceptions on same, their preferred choice of financing long term projects, whether firms face difficulties in accessing financing and the sources of finance used.

To this end, a deductive approach has been used through a survey of a stratified sample of 100 largest firms and a simple random sampling of 300 SME's. It is found that both large and SMEs perceive investment and dividend decisions to be interconnected and managers have better insider information than outside stakeholders. Large firms cut dividend payments when the firms' prospects are poor, there is uncertainty in the firms' future earnings, and they would only increase the payment if the company would be able to pay in the future. Moreover, dividend payment behaviour of such companies can be dictated by analysing the performance of such companies.

In conglomerate structures of large firms, the dividend paid by a subsidiary is dictated by the holding company, as well as the cash needs of other firms in the structure. Firms with high growth prospects prefer to cut dividend payments and use the funds for future investments. Hence, most large firms have a preference for bonus issues rather than cash dividend

payments. They have a tendency to defer dividend payments for the future. Large firms prefer to issue ordinary shares, rather than taking debts in the market. Most of the large firms surveyed, especially those that are family-owned, face difficulties in raising external financing. Thus, they prefer internal finance in terms of retained earnings as their first choice of financing.

Compared to the large firms, the dividend payment of SMEs is mostly from cash resources available in the firm. Moreover, most dividend payment of SMEs is dictated by earnings, cash availability and capital expenditure budget for the following year. Very few SMEs have a constant dividend pay-out rate, hence making dividend payment behaviour unpredictable. Most of the SME's also prefer to use internal financing rather than taking debts or issuing shares. As is the case for large firms, SMEs also face a lot of inconvenience in obtaining external financing. However, those on group structure face fewer problems.

---

## Notes

- (1) Henceforth FHP.
- (2) Their results were more robust than FHP since they found a more significant coefficient of Tobin's Q in their investment equations.
- (3) Marginal Q also.
- (4) Other debates include KZ (2000) and FHP (2000).
- (5) However, there are some disadvantages. Answers are structured, and respondents may feel that limited choices are imposed on them. The research might be a bit shallow and often gradation and opinions, which would have given a greater insight into the phenomenon, will be lost.
- (6) Actual values to exceed critical values.

---

## References

- Agca, S. and Mozumdar, A., 2008. The impact of capital market imperfections on investment-cash flow sensitivity. *Journal of Banking and Finance*, 32 (2), pp. 207-216.
- Almeida, H., Campello, M., Laranjeira, B. and Weisbenner, S., 2011. Corporate debt maturity and the real effects of the 2007 credit crisis. *Critical Finance Review*, 1, pp. 3-58.
- Allayannis, G. and Mozumdar, A., 2004. The impact of Negative Cash Flow and influential Observations on Investment-Cash flow Sensitivity Estimates. *Journal of Banking and Finance*, 28, pp. 901-930.
- Baum, C.F., Schäfer, D. and Talavera, O., 2011. The impact of the financial system's structure on firms' financial constraints. *Journal of International Money and Finance*, 30 (4), pp. 678-691.
- Beck, T., Demirguc-Kunt, Laeven, A. and Maksimovic, V., 2006. The Determinants of Financial Obstacles. *Journal of International Money and Finance*, 25 (6), pp. 932-952.
- Berger, A.N. and Udell, G.F., 1998. The Economics of Small Business Finance: The Role of Private Equity and Debt Markets in the Financial Growth Cycle. *Journal of Banking and Finance*, 22, pp. 613-673.
- Bigsten, A., Collier, P., Dercon, S., Fafchamps, M., Gauthier, B., Gunning, J.W., Söderbom, M., Oduro, A., Oostendorp, R., Pattillo, C., Teal, F. and Zeufack, A., 2003. Credit Constraints in Manufacturing Enterprises in Africa. *Journal of African Economies*, 12(1), pp. 104-125.
- Blundell, R., Gri, T.H. and Van, R., 1999. Market Share, Market value and Innovation in a Panel of British Manufacturing Firms. *Review of Economic Studies*, 66, pp. 529-554.
- Bogdan, R.C. and Biklen, S.K. 2003. *Qualitative research for education: An introduction to theories and methods*. 4th ed. Allyn and Bacon; Boston.
- Bougheas, S., Mizen, P. and Yalcin, Y., 2006. Access to External Finance: Theory and Evidence on the Impact of Monetary Policy and Firm-Specific Characteristics. *Journal of Banking and Finance*, Vol. 30, pp. 199-227.
- Bond, S. and Cummins, J., 2001. Noisy Share Prices and the Q Model of Investment, *Institute for Fiscal Studies, Working Paper*, No. 22.

- Bottazzi, G., Secchi, A. and Tamagni, F., 2008. Productivity, profitability and financial performance. *Industrial and Corporate Change*, Vol. 17, No. 4, pp. 711-751.
- Bond, S. and Meghir, C., 1994. Dynamic Investment models and the Firm's Financial Policy. *Review of Economic Studies*, 61 (2), 197-222.
- Bonnet, J., Cieply, S. and Dejardin, M., 2005. Financial Constraints on New Firms: Looking for Regional Disparities. *Brussels Economic Review*, Vol. 3, pp. 217-246.
- Bonnet, J., Cieply, S. and Dejardin, M., 2005. Financial Constraints on New Firms: Looking for Regional Disparities. *Brussels Economic Review*, Vol. 3, pp. 217-246.
- Blundell, R.W., Bond, S., Devereux, M. and Schiantarelli, F., 1992. Investment and Tobin's Q. *Journal of Econometrics*, 51, 233-257.
- Brown, J.R. and Petersen, B.C., 2009. Why has the investment-cash flow sensitivity declined so sharply? Rising R&D and equity market developments. *Journal of Banking and Finance*, Vol. 33, No. 5, pp. 971- 984.
- Canton, E., Grilo, I., Monteagudo, J. and Van Der Zwan, P., 2010. Investigating the Perceptions of Credit Constraints in the European Union, *ERIM Report Series Research*.
- Carreira, C. and Silva, F., 2010. No deep pockets: Some stylized results on firms' financial constraints. *Journal of Economic Surveys*, Vol. 24, No. 4, pp. 731-753.
- Carreira, C. and Silva, F., 2012, Where Are the Fragilities? The Relationship between Firms' Financial Constraints, Size, and Age. In: Andrade, J.S. et al. (eds.), *Managing Structural Changes: Trends and Requirements*, FEUC, Coimbra, pp. 184-198.
- Chirinko, R.S., 1993. Multiple Capital Inputs, Q and Investment Spending. *Journal of Economic Dynamics and Control*, Vol.17, No. 5-6, pp. 907-938.
- Carpenter, R.E. and Peterson, B.C., 2002. Is The Growth Of Small Firms Constrained By Internal Finance. *The Review of Economics and Statistics*, Vol. 84, No. 2, pp. 298-309.
- Chapman, D.R., Junor, C.W. and Stegman, T.R., 1996. Cash flow constraints and firms' investment behaviour. *Applied Economics*, 28, 1037-1044.
- Cleary, S., Povel, P. and Raith, M., 2004. The U-shaped Investment curve: theory and Evidence. *Centre for Economic policy Research discussion Paper*, 4206.
- Cleary, S., 1999. The Relationship between firm Investment and Financial Status. *Journal of Finance*, 54 (2), pp. 673-692.
- Cleary, S., 1999. The Relationship between firm Investment and Financial Status. *Journal of Finance*, 54 (2), pp. 673-692.
- Cleary, S., Povel, P. and Raith, M., 2004. The U-shaped Investment curve: theory and Evidence. *Centre for Economic policy Research discussion Paper*, 4206.
- D'espallier, B., Vandemaele, S. and Peeters, L., 2008. Investment-cash flow sensitivities or cash-cash flow sensitivities? An evaluative framework for measures of financial constraints. *Journal of Business Finance and Accounting*, Vol. 35, No. 7-8, pp. 943-968.
- Fagiolo, G. and Luzzi, A., 2006. Do liquidity constraints matter in explaining firm size and growth? Some evidence from the Italian manufacturing industry. *Industrial and Corporate Change*, Vol. 15, No. 1, pp. 1-39.
- Fazzari, S., Hubbard, G. and Petersen, B., 1988. Financing constraints and corporate investment. *Brookings Papers on Economic Activity* 1, pp. 141-195.
- Fazzari, S., Hubbard, R.G. and Petersen, B.C., 2000. Investment-Cash Flow Sensitivities Are Useful: A Comment on Kaplan and Zingales. *Quarterly Journal of Economics*, Vol. 115, No. 2, pp. 695-705.
- Gomes, J.F., 2001. Financing investment. *American Economic Review*, Vol. 91, No. 5, pp. 1263-1285.
- Guariglia, A., 2008. Internal financial constraints, external financial constraints and investment choice: Evidence from a panel of UK firms. *Journal of Banking and Finance*, Vol. 32, No. 9, pp. 1795-1809.
- Hadlock, C. and Pierce, J., 2010. New Evidence on Measuring Financial Constraints: Moving Beyond the KZ Index. *The Review of Financial Studies*, Vol. 23, No. 5, pp. 1909-1940.
- Hadlock, C., 1998. Ownership, Liquidity, and Investment. *RAND Journal of Economics*, Vol. 29, No. 3, pp. 487-508.
- Hadlock, C. and Pierce, J., 2010. New Evidence on Measuring Financial Constraints: Moving Beyond the KZ Index. *The Review of Financial Studies*, Vol. 23, No. 5, pp. 1909-1940.
- Hayashi, F., and Inoue, T., 1991. The Relation between Firm Growth and q with Multiple Capital Goods: Theory and Evidence from Panel Data on Japanese Firms.' *Econometrica*, Vol. 59, No. 3, pp. 731-53.
- Huafeng, C., and Shaojun, C., 2012. Investment-Cash Flow Sensitivity Cannot Be a Good Measure of Financial Constraints: Evidence from the Time Series. *Journal of Financial Economics*, Vol. 103, No. 2, pp. 393-410.
- Hovakimian A. and Hovakimian, G., 2009. Cash flow sensitivity of investment. *European Financial Management*, Vol. 15, No. 1, pp. 47-65.
- Hoshi, T., Kashyap, A. and Scharfstein, D., 1991. Corporate Structure, Liquidity, and Investment: evidence from Japanese Industrial Groups. *Quarterly Journal of Economics*, 106, pp. 33-60.

- Huang, Z., 2002. Financial Constraints and Investment-Cash Flow Sensitivity. *Mimeograph*, St. Hugh's College, University of Oxford.
- Han, S. and Qiu, J., 2007. Corporate Precautionary Cash Savings. *Journal of Corporate Finance*, Vol. 13, pp. 43-57.
- Kaplan, S. and Zingales, L., 1997. Do Financially Constraints explain why Investment is Correlated with Cash Flow. *Quarterly Journal of Economics*, 112, pp. 169-215.
- Kounouwewa, J. and Chao, D., 2011. Financing Constraints Determinants in African Countries. *The International Journal of Applied Economics and Finance*, Vol. 5, No. 1, pp. 30-45.
- Kadapakkam, P., Kumar, P. and Riddick, L., 1998. The impact of Cash Flow and Firm size on Investment: The international Evidence. *Journal of Banking and Finance*, 22, pp. 293-320.
- Kaplan, S.N. and Zingales, L., 2000. Investment-cash flow sensitivities are not valid measures of financing constraints. *Quarterly Journal of Economics*, pp. 169-215.
- Kira, A.R., 2013. Determinants of Financing Constraints in East African Countries' SMEs. *International Journal of Business and Management*, Vol. 8, No. 8, pp. 49-68.
- Lamont, O., 1997. Cash Flow and Investment: Evidence from Internal Capital Markets. *Journal of Finance*, Vol. 52, No. 1, pp. 83-109.
- Lintner, J., 1962. Dividends, earning, leverage, stock price, and the supply of capital to corporations. *Review of Economics and Statistics*, 44, pp. 243-269.
- Love, I., 2003. Financial Development and Financing Constraints: International Evidence from the Structural Investment Model. *The Review of Financial Studies*, Vol. 16, No. 3, pp. 765-791.
- Merriam, S.B. 1998. Qualitative research and case study applications in education. Thousand Oaks, CA: Sage.
- Mizen P. and P. Vermeulen 2005. Corporate Investment and cash flow sensitivity, *European Central Bank Working Paper Series* 485, Frankfurt.
- Oliveira, B. and Fortunato, A., 2006. Firm growth and liquidity constraints: A dynamic analysis. *Small Business Economics*, Vol. 27, pp. 139-156.
- Pal, R. and Ferrando, A., 2010. Financing constraints and firms' cash policy in the euro area. *The European Journal of Finance*, Vol. 16, No. 2, pp. 153-171.
- Schiantarelli, F., 1996. Financial Constraints and Investment: Methodological issues and International evidence. *Oxford Review of Economic Policy*, 12, 2, pp. 70-87.
- Schaller, H., 1993. Asymmetric Information, Liquidity Constraints and Canadian Investment. *Canadian Journal of Economics*, Vol. 26, No. 3, pp. 552-574.
- Savignac, F., 2008. Impact of Financial Constraints on Innovation: What Can Be Learned from a Direct Measure. *Taylor and Francis Journals of Economics of Innovation and New Technology*, Vol. 17, No. 6, pp. 553-569.
- Shaw, E.S. 1973. *Financial Deepening in Economic Development*. New York. Oxford University Press.
- Stiglitz, J.E. 1986. Externalities in Economics with Imperfect Information and Incomplete Markets. *Quarterly Journal of Economics*, pp. 229-264.
- Walter, J.E., 1963. Dividend Policy: Its Influence on the Value of the Enterprise. *Journal of Finance*, 18, May, pp. 280-291.
- Whited, T., 1992. Debt, Liquidity Constraints, and Corporate Investment: Evidence from Panel Data. *Journal of Finance*, Vol. 47, No. 4, pp. 1425-1460.
- Whited, T. and W.U.G., 2006. Financial Constraints Risk, *Review of Financial Studies*, Vol. 19, No. 2, pp. 531-559.
- Whited, T., 1992. Debt, Liquidity Constraints, and Corporate Investment: Evidence from Panel Data. *Journal of Finance*, Vol. 47, No. 4, pp. 1425-1460.

# Political connection and allocation of capital in the corporate sector in Mauritius. A game approach (theoretical relationship)

**Chakeel PRAYAGSING**

University of Mauritius, Moka, Mauritius

prayagsic@gmail.com

**Kheswar JANKEE**

University of Mauritius, Moka, Mauritius

c.jankee@uom.ac.mu

**Abstract.** *This Paper develops a unique Game Theoretical Analysis to test the existence of political connections of firms in Mauritius. A decision tree analysis, with Nash Equilibrium is solved to make decisions about corporate political behaviour. From the point of view of game theory, by building static and dynamic game models, the authors investigate the game relationship of political associations between government and firms which affect the efficient allocation of capital in Mauritius. It additionally uncovers that political associations between the government and firms that determine the allocation of finance. This paper illustrates political connections in the allocation of funds and thus contributes to the theoretical literature in the field for the case of a small island developing state.*

**Keywords:** capital allocation, game theory, Nash equilibrium, corporate political behaviour.

**JEL Classification:** G32, G39.

## 1. Introduction and research motivation

Efficient allocation of capital is of utmost significance for firms and ultimately to the economy. With development of the banking sector, government's intervention (either directly or indirectly), regulation and political connection, it is important to investigate the relationship between political connection and efficient allocation of capital in firms. Moreover, efficient allocation of finance influences not just the credibility of companies and of the economy but also the vital fundamental responsibilities of a country.

Because of asymmetric information, efficient allocation of finance expects firms to be strictly disciplined and demand strict supervision and good administration of government sectors. When they serve the citizens through a tight budget, the government seems to utilize powers to take an interest in certain financial movement concerning political associations with enterprises, hence opening opportunities for a couple of advantaged people to derive excess income.

Guaranteeing efficient allocation of capital/finance, initially relies upon sound laws and regulations. Moreover, government divisions must work towards enforcing the law, introduce proper rules through the Regulator (Central Bank), and avoid preference or rent seeking activities. Secondly, the firms need to regulate their own internal systems to ensure efficient allocation of finance and keeping the ethics of the industry.

From the point of view of game theory, by building static and dynamic game models, this paper innovatively breaks down the game relationship of political associations between government and firms which affect the efficient allocation of capital in Mauritius. It additionally uncovers that political associations between the government and firms that determine the allocation of finance. This paper illustrates political connections in the allocation of funds and thus contributes to the theoretical literature in the field for the case of Mauritius.

## 2. Organisation of the paper

The Paper is organized as follows: Following the introduction in section 1, section 3 reviews the different theoretical underpinnings regarding the relationship between politics and firms. Application of Game theory in corporate finance is made in section 4 while section 5 undertakes this analysis for firms in Mauritius. Section 6 concludes the Paper.

## 3. Theoretical development

Several reasons for corporate political behaviour have been advanced in the literature. These include increasing profits, to maintain market, maintain image in the market and for their private interests the impact of government policies however, is not equal across all firms. Different firms operating in different operating environment have different expectations from the government in power. Hence, firms use the political resources available to get benefits such as reduced costs of capital, reduced uncertainty in the market and increased profitability.

Corporate political activities affect the performance of firms. Many corporates are involved in political activities through political donations, direct lobbying and bribing. Companies use several tactics to influence the government decision and to extract benefits from them in terms of access to markets or to chapter capital. These companies conduct corporate political behaviour and Business–Government relations and lobbying.

A political economy strand has been taken to clarify financial regulation where by political bodies electorate influence policy reforms and their timings. Additionally, politics influence the control of power between small investors and big investors in corporate fund, by establishing regulation to secure the minority investors. Government can have a much more

straightforward impact over organizations by taking a direct stake in their proprietorship structure or by divesting from them. Institutional and legal consideration have been regarded while talking about capital streams from one nation to the other. In a similar domain, distinctive sorts of financiers and shareholders insurance exist in various nations. Furthermore, following Stiglitz's (1999) famous paper on market failures in the economy, politicians mediate and intervene during bank failures and during other economic recession.

Researchers have shown a positive link between political connections and corporate performance (e.g., Hansen and Mitchell, 2000). Hill et al. (2013) used an indicator of political connection, namely corporate lobbying activity in terms of expenditures with a panel data set of 2,159 firm years across 324 unique US S&P 500 companies over the period 1996-2006. They found that the level of cash holdings by the firm was dependent on the extent of political lobbying by the firm. The higher the lobbying expenditure, the less financially constrained the firms were and they kept less cash flow to finance expenditures. This is because they could easily access finance in the external market. These results were robust after controlling for other factors affecting the firms, that is demand for liquidity position as well as econometric formulations.

There have been numerous studies on the involvement of politics with finance availability of companies. Politically connected firms had a higher chance of accessing credit (Hasan et al., 2013) and have easier access to finance (Chan et al., 2012b), compared to family owned business which relied heavily on internal finance (Xu et al., 2013).

Some previous studies are witness that firms which provide political contributions for elections experienced higher stock returns, contrary to those which did not contribute (Claessens et al., 2008). This is because politicians use their power to ease bank financing to firms which have helped financially to win elections.

Richter et al. (2009) revealed that political connections enabled easy access to finance in different countries, notably equity finance. Moreover, political connections have a much higher significance in accessing international finance, as compared to political connections locally. However, Leuz and Oberholzer-Gee (2006) found that politically connected firms (PCF) are less likely to access finance in the international market than firms without political ties. Even though, PCF benefit from easy financing and have a greater market share, they have poor accounting performance than non-PCF (Faccio, 2006, 2010).

However, it is also empirically proven that, PCF are detrimental for the economy (Khwaja and Mian, 2005). The effects are more pronounced when the politicians move out from power leading to reduced access to bank financing by the concerned enterprise (Dombrovsky, 2008).

Jiangtao et al. (2015) analysed the behaviour of firms in Indonesia over the period September to December 2014. The main research interest was to test the relationship between political and economic connections of firms with the level of financing access. With a sample size of 296 firms in 5 sectors and across 17 cities, they found that political connections resulted to preferential access to financial resource via easier access to preferential loans from state-owned banks, and political connections acting as a collateral in access to finance. For a much deeper analysis, they illustrated that informal connections to political parties in government had a higher influence to have access to finance than formal connections. However, the research found that political connections resulted to easier access to finance but to lower productivity sectors.

Tang et al. (2016) used a Dynamic Stochastic General Equilibrium model to prove that firms with political connections had a higher loan to value ratio than those which were not connected. State enterprises had political connections than other private firms and hence had a higher ratio. This was an intensive research conducted with primary data, known as Discriminatory Credit Constraint. Data from Chinese manufacturing firms were used.

Hasan et al. (2014) investigated the relationship between political connections and access to finance in Poland with Panel data over the period 2001 to 2011. It was found that 128 out of 349 firms were politically connected and had a higher chance of accessing credit. Political connection was measured by a person in the firm who left politics a few years ago. The political ties and their impact of firms' financing was stronger with relationship with central government than with local authorities. This result was proved in alternative sensitivities, notably when different analysis was made for different conditions in the loan market.

Chan et al. (2012b), used a database of 1347 entities over the period 2005-2007 and found that politically connected firms were not financially constrained. Xu et al. (2011) analysed the same issue for the period 2000 to 2007 for Chinese family owned business. They found that these businesses relied heavily on internal cash flows to finance investment. However, those who were close to political parties in power could access cheaper funding from banks and hence ease their financial constraints.

Houston et al. (2012) collected primary data for 500 companies over the period 2003-2008 of listed companies in the US. Their results found that the cost of bank loans was significantly lower for companies that had a board member with political parties. This result was more pronounced for corporate with more government procurement dependence, less relationship lending, lower credit ratings, for firms facing stronger foreign competition and for firms during the recent global financial crisis. They analysed firms before and after democratic elections of 2006. It was found that firms which helped the political party in power experienced a decline in their cost of debt. They found that political parties in power influence positively the decision of a bank to grant a loan to firms with who they are close.

Using data from 234 politically connected firms in 12 developed and 11 developing countries over the period 1989 to 2003, Boubakri et al. (2012) found that companies which were close to politics had better performance through a better and increased access to bank financing. They used ties to politicians in their methodology.

Chan et al. (2011) investigated financial constraints and political connections in China. They found that politically connected firms were less financially constrained. As a measure of political connection, they tested whether the CEO was a government official, military officer or someone with a political ranking or ministerial level. 12400 firms were used in this study to provide a direct test as to whether was affected by political connections and whether government connections matter in FC. Several sensitivities with investment model were used.

#### 4. Application of game theory in corporate finance

Game theory and decisions have been applied in various literature in corporate finance. This is because stakeholders are interrelated to each other, such that more dividends payments imply less internal funds available. Finance has a wide-ranging purpose but specifically with how the reserve funds of investors are distributed through financial markets and intermediaries to firms and who utilize them to finance their exercises.

Capital structure manages the company's choice to raise finance through debt versus equity and what proportion of debt to equity must the firm keep up. In 1984 Myers and Majluf built up a model founded on asymmetric information that claims that management has superior information of the forecast of the firm than the capital markets. On the off chance, that managers believe that the market is as of now underestimating its company's value (equity) then it will be reluctant to raise cash through an equity issue since it will offer the stock at a markdown. Then again, managers may be enthusiastic to issue equity if it believes its stock is overrated, because it will offer its stock at a premium.



Financial specialists and investors are not unstimulating and will foresee that managers will probably issue stock when they think it is overestimated while idealistic managers may cross out or concede issues. Consequently, when an equity issue is declared, speculators will write down the cost of the stock in like manner. In this way equity issues are viewed as an awful flag or bad signal, even organizations with overrated stock would lean toward another alternative to raise cash to evade the mark down in stock cost. Firms usually avoid using information sensitive sources of finance. This prompts the pecking order of corporate financing: Retained earnings are the most favoured, trailed by debt, followed by securities, for example, convertible security and finally equity.

Another presentation of game theory to capital structure revolves around the concept of agency costs. In 1976 Jensen and Meckling depicted two sorts of agency issues in companies: One between equity owners and bondholders and the other amongst managers and equity owner. The former emerges because the proprietors of a levered firm have a motivation to take riskier projects to the detriment of bondholders. Stockholders of levered firms win when management increases business risks since they get the surplus when yields are big however the bondholders suffer the most when default happens. Bondholders' worth does not grow with the estimation of the firm, in this way they might want the firm to take easy wins to limit the danger of default. Equity holders then again, get whatever is remaining in the wake of paying back bondholders. They might want to see the upside capability of the organization amplified and this happens through taking on risky assignment (greater yields are created through adoption riskier projects). There is an irreconcilable circumstance between equity holders' eagerness for business risk and bondholders' antipathy for business risk.

The second clash emerges when equity owners can't completely control the activities of managers. This happens when directors have an impetus to seek after their own advantages as opposed to those of the equity holders. Official remuneration as alternative contracts can encourage managers to settle on riskier choices trying to gain the highest return from the call options. Higher risk expands the worth of an option, however risk can likewise make a stock value take a plunge.

One of the ideas driving proficient markets is the market for corporate control. The market for corporate control says that with the end goal for assets to be utilized effectively, organizations should be controlled by the most capable and competent managers. One approach to accomplish this is through corporate acquisitions. An organization is not liable to buy another organization except it believe it can run it superior to the present administration. This can be through new administrations or synergies that happen due to the operational productivity of the consolidated firms. Shareholders of the organization to be amassed, understand that the new management will keep lead their organization more proficiently and in this way their shares will be worth more than before the purchase of their company.

## 5. Application of game theory in understanding the decisions of firms in Mauritius

In this section, we develop a unique Game theoretical Analysis to test the existence of political connections of firms in Mauritius. A decision tree analysis, with Nash Equilibrium are solved to make decisions about corporate political behaviour.

### 5.1. Static game between the government and companies

#### 5.1.1. Establishment of the static model

##### *Consider the behaviour*

We must clear the conduct of the members, to be specific, the government and firms and in addition their conduct in allocating capital. Static game is the rule that participant either

participate in the selection simultaneously, or on the off chance that they are not in a similar choice, the last performer does not know the particular move that had been made before in the game. The game between the government and firms constitutes a static game where they are aware of all information.

**Table 1.** Game matrix of the government and firms.

Firms	Government through Central Bank	
	Supervision through Central bank $p_1$	Nonsupervision $1 - p_1$
Efficient allocation of funds $p_2$	$\pi - \alpha_2, -\alpha_1$	$\pi - \alpha_2, 0$
Non efficient allocation of funds $1 - p_2$	$\alpha_3 - \alpha_1$	$0, -\alpha_5$

Source: Author.

**Table 2.** Game matrix of the government and manufacturers.

Firms	Government through Central Bank	
	Supervision through Central bank $p_1$	Nonsupervision $1 - p_1$
Efficient allocation of funds $p_2$	$\pi - \alpha_2, -\alpha_1$	$-\alpha_3, \alpha_3 - \alpha_1$
Non efficient allocation of funds $1 - p_2$	$\pi - \alpha_2, 0$	$0, -\alpha_4 - \alpha_5$

Source: Author.

### Assumptions

The cost used by Government/Central Bank to regulate banking sector and safe behaviour of firms by administration, economic, legal, and other means is  $\alpha_1$  and its probability is  $P_1$ . If firms can recognize the importance of efficient allocation of finance by following the guidelines and paying their interest, the cost paid should be  $\alpha_2$ . This can be measured by list of bad debts or numbers of non-performing loans. The intangible benefit bought by the credibility through the society is  $\pi$  which has a probability of  $P_2$ . If firms focus on short term interest revert to bad governance and behave contrarily to the rules of the Central Bank, damage to social image is  $\alpha_3$ .  $\alpha_4$ : The lost social cost when negative political connections are established between government and firms. That is, if their objectives are not aligned with shareholders' interests. It leads to reputational damage. To measure this, take a sample of companies, study their objectives compare it to shareholders interest. The cost of losing government credibility is  $\alpha_5$ .

If the government does not deal with efficient allocation of finance to firms properly, its image will tarnish. At the point when  $\alpha_5$  is less than  $\alpha_5 - \alpha_5$ , Nash equilibrium happens (disregarding efficient allocation of capital and supervision). The lost social cost  $\alpha_4$  caused by negative political associations should to be ascribed to the government because the loss of social cost is substantially higher than the cost when the government ensure regulation of the banking sector, which is  $\alpha_1 - \alpha_3 < \alpha_1 < \alpha_4$ . Along these lines, social weight triggers the state to utilize different methods to direct and ensure efficient allocation of finance. The game matrix of the political associations between the State through the Central Bank and firms is displayed in Table 2.

### Solving the game model

The expected revenue function of political connections between firms and the government is shown by the following:

$$E_G = p_1 [-p_2\alpha_1 + (1 - p_2)(\alpha_3 - \alpha_1)] + (1 - p_1)(1 - p_2)(-\alpha_4 - \alpha_5),$$

$$\frac{\partial E_G}{\partial p_1} = -p_2\alpha_1 + (1 - p_2)(\alpha_3 - \alpha_1) + (1 - p_1) - (1 - p_2)(-\alpha_4 - \alpha_5),$$

$$= -p_2\alpha_1 + \alpha_3 - p_2\alpha_3 - \alpha_1 + p_2\alpha_1 + 1 - p_1 - [-\alpha_4 - \alpha_5 + p_2\alpha_4 + p_2\alpha_5],$$

$$= -p_2\alpha_1 + \alpha_3 - p_2\alpha_3 - \alpha_1 + \alpha_4 + \alpha_5 - p_2\alpha_4 - p_2\alpha_5 = 0$$

$$= -p_2(\alpha_3 + \alpha_4 + \alpha_5) + \alpha_3 - \alpha_1 + \alpha_4 + \alpha_5 = 0$$

$$\begin{aligned}
-p_2 (\alpha_3 + \alpha_4 + \alpha_5) &= \alpha_1 - (\alpha_3 + \alpha_4 + \alpha_5) \\
p_2 (\alpha_3 + \alpha_4 + \alpha_5) &= (\alpha_3 + \alpha_4 + \alpha_5) - \alpha_1 \\
p_2 &= \frac{(\alpha_3 + \alpha_4 + \alpha_5) - \alpha_1}{\alpha_3 + \alpha_4 + \alpha_5} \\
P_2^* &= 1 - \frac{\alpha_1}{\alpha_3 + \alpha_4 + \alpha_5} \\
E_G &= p_2 [p_1 (\pi - \alpha_2) + (1 - p_1) (\pi - \alpha_2)] - (1 - p_2) p_1 \alpha_3. \\
\frac{\partial E_G}{\partial P_2} &= p_1 (\pi - \alpha_2) + \pi - \alpha_2 - p_1 \pi + p_1 \alpha_2 + p_1 \alpha_3 \\
p_1 \pi - p_1 \alpha_2 + \pi - \alpha_2 - p_1 \pi + p_1 \alpha_2 + p_1 \alpha_3 &= 0 \\
\pi - \alpha_2 + p_1 \alpha_3 &= 0 \\
p_1 \alpha_3 &= \alpha_2 - \pi \\
P_1^* &= \frac{\alpha_2 - \pi}{\alpha_3},
\end{aligned} \tag{1}$$

The solved mixed strategy Nash equilibrium [12] is

$$P_1^* = \frac{\alpha_2 - \pi}{\alpha_3}, P_2^* = 1 - \frac{\alpha_1}{\alpha_3 + \alpha_4 + \alpha_5} \tag{2}$$

The relation between  $p_1^*$  and  $p_2^*$  is

$$P_2^* = 1 - \frac{p_1^* \alpha_1}{\alpha_2 - \pi + \alpha_4 p_1^* + \alpha_5 p_1^*}, \tag{3}$$

The first derivative of  $p$  (4)

$$P_2^{*'} = 1 - \frac{p_1^* \alpha_1}{\alpha_2 - \pi + \alpha_4 p_1^* + \alpha_5 p_1^*},$$

When  $\pi - \alpha_2 > 0$ ,  $\pi > \alpha_2$ ,  $P_2^* > 0$ , and  $P_2^*$  is an increasing function

## Results analysis

Equation (3) illustrates that the smaller the governmental regulatory cost through the Central Bank  $\alpha_1$ , the greater the social cost  $\alpha_4$  and the lost credibility  $\alpha_5$  caused by the government failure to regulate and the greater the  $p_2$  probability of firms esteeming efficient allocation of finance.

Equation (4) demonstrates that when the profits a firm gains due to probability are greater than its cost of regulation, the probability  $p_2$  of valuing the efficient allocation of finance increases along with the rising of probability  $p_1$  of the supervision of the government.

### 5.2. Dynamic game between the government and companies

Dynamic game implies that the activities of people included follow an order and that the activity of the previous individual can be seen by the last mentioned. In light of the incorrectness of the data, for example, the attributes of different members, the strategy space, and payoff function and the guideline of order and repeating a game incorporates, the game between the State and firms constitutes a dynamic round of incomplete data.

## Foundation of the dynamic game model

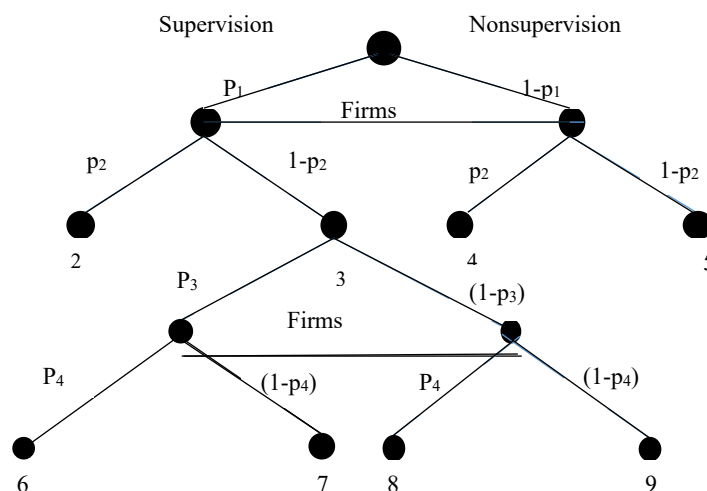
### Suppositions:

- the cost utilized by the government or Central Bank to monitor the good conduct of firms by regulatory, economic, legitimate, administrative, and different methods is  $\alpha_1$ , and its likelihood is  $p_1$ ;
- if the firms can realise the significance of efficient allocation of finance by following the guidelines and effectively participate with government directions, the cost paid ought to be  $\alpha_2$ , and the impalpable advantage brought by credibility is  $\pi_1$ , which has a probability of  $p_2$ ; If firms focus on short term interest revert to bad governance, and behave contrarily to the rules of the Central Bank, damage to social image is  $\alpha_2$  and the cost of the credibility is  $\alpha_4$ ;
- in the case that the government misuse power (with a likelihood or probability of  $p_3$ ), if the firms don't ascribe significance to efficient allocation of funds and bribe.  $\sigma\alpha_2$  ( $0 < \sigma < 1$ ) the pertinent government authorities so as to avoid sentence, the likelihood of bribery is  $p_4$ . In the event that the government authorities consume bribes  $\sigma\alpha_2$  of firms as their own income, the loss of credibility is  $\alpha_5$ ; under the condition that firms neither connect significance to efficient allocation of funds nor to bribing the state, the fine charged from firms by the pertinent government authorities because of misuse and abuse of power ought to be  $\beta\alpha_3$ ,  $\beta > 1$ ;
- if the government authorities don't mishandle their power, rather they will submit the bribe  $\sigma\alpha_2$  and the fine  $\alpha_3$  to the treasury on their own, and the state will give legitimate impetuses  $\beta(\sigma\alpha_2 + \alpha_3)$   $0 < \beta < 1$  for them;
- important government authorities don't oversee and firms don't join significance to efficient allocation of capital, causing genuine effect on society. Losses caused by the defaulting of significant government authorities are  $\alpha_6$  (counting loss of credibility and the subsequent loss of social expenses).

The game tree of the state and the firms is illustrated in Figure 1.

**Figure 1.** Game tree of government and the manufacturers.

Government



Source: Author.

Revenue of each node in the game tree:

- $(E_{21}, E_{22})$
- $(-\alpha_1, \pi_1 - \alpha_2)$
- $(E_{11}, E_{12})$
- $(0, -\alpha_2)$

$$5) (-\alpha_6, 0)$$

$$6) (-\alpha_1 + \sigma\alpha_2 - \alpha_5, -\sigma\alpha_2 - \alpha_4)$$

$$7) (-\alpha_1 + \mu\alpha_3 - \alpha_5, -\mu\alpha_3 - \alpha_4)$$

$$8) (-\alpha_1 + \beta(\sigma\alpha_2 + \alpha_3), -\sigma\alpha_2 - \alpha_3 - \alpha_4)$$

$$9) (-\alpha_1 + \beta\alpha_3, -\alpha_3 - \alpha_4).$$

### Seeking Nash equilibrium in dynamic game problem

This backward induction method is for this dynamic game problem to seek the equilibrium value. Firstly, expectation of node 3 is computed. Consider

$$\begin{aligned} E_{11} &= p_3 p_4 (-\alpha_1 + \sigma\alpha_2 - \alpha_5) \\ &+ p_3 (1 - p_4) (-\alpha_1 + \mu\alpha_3 - \alpha_5) \\ &+ (1 - p_3) p_4 [-\alpha_1 + \beta(\sigma\alpha_2 + \alpha_3)] \\ &+ (1 - p_3) (1 - p_4) (-\alpha_1 + \beta\alpha_3), \end{aligned} \quad (5)$$

$$\begin{aligned} E_{12} &= p_3 p_4 (-\sigma\alpha_2 - \alpha_4) \\ &+ p_3 (1 - p_4) (-\mu\alpha_3 - \alpha_4) \\ &+ (1 - p_3) p_4 (-\sigma\alpha_2 - \alpha_3 - \alpha_4) \\ &+ (1 - p_3) (1 - p_4) (-\alpha_3 - \alpha_4). \end{aligned} \quad (6)$$

The Nash equilibrium of formula (5) and formula (6) is sought as follow:

$$\begin{aligned} \frac{\partial E_{11}}{\partial p_3} &= p_4 (-\alpha_1 + \sigma\alpha_2 - \alpha_5) + (1 - p_4) \\ &\times (-\alpha_1 + \mu\alpha_3 - \alpha_5) \\ &- p_4 [-\alpha_1 + \beta(\sigma\alpha_2 + \alpha_3)] \\ &- (1 - p_4) (-\alpha_1 + \beta\alpha_3) = 0, \end{aligned}$$

$$\begin{aligned} \frac{\partial E_{12}}{\partial p_4} &= p_3 (-\sigma\alpha_2 - \alpha_4) - p_3 (-\mu\alpha_3 - \alpha_4) \\ &+ (1 - p_3) (-\sigma\alpha_2 - \alpha_3 - \alpha_4) \\ &- (1 - p_3) (-\alpha_3 - \alpha_4) = 0, \end{aligned}$$

$$P_3^* = \frac{\sigma\alpha_2}{\mu\alpha_3}, P_4^* = \frac{(\beta - \mu)\alpha_3 + \alpha_5}{\sigma(1 - \beta)\alpha_2 - \mu\alpha_3}$$

Substituting  $(P_3^*, P_4^*)$  into formula (5) and formula (6), we can obtain

$$\begin{aligned} E_{11}^* &= -\alpha_1 + \alpha\beta p_4^* \alpha_2 + \beta\alpha_3, \\ E_{12}^* &= \frac{\sigma(1 - \mu)}{\mu} \alpha_2 - \alpha_3 - \alpha_4. \end{aligned} \quad (8)$$

Second, the expected value of node 1 is calculated as follow:

$$\begin{aligned} E_{21}^* &= -p_1 p_2 \alpha_1 - (1 - p_1) (1 - p_2) \alpha_6 + p_1 (1 - p_2) E_{11}^*, \\ E_{22}^* &= -(1 - p_1) p_2 \alpha_2 + p_1 p_2 (\pi_1 - \alpha_2) + p_1 (1 - p_2) E_{12}^* \end{aligned} \quad (9)$$

We can seek the Nash equilibrium of the game problem as follows:

$$\frac{\partial E_{21}}{\partial p_1} = -p_2 \alpha_1 + (1 - p_2) \alpha_6 + (1 - p_2) E_{11}^* = 0,$$

$$\frac{\partial E_{22}}{\partial p_2} = -(1 - p_1) \alpha_2 + p_1 (\pi_1 - \alpha_2) - p_1 E^*_{12} = 0. \quad (10)$$

### First equation

$$E^*_{21} = -p_1 p_2 \alpha_1 - (1 - p_1) (1 - p_2) \alpha_6 + p_1 (1 - p_2) E^*_{11},$$

$$\frac{\partial E_{21}}{\partial p_1} = -p_2 \alpha_1 + (1 - p_2) \alpha_6 + (1 - p_2) E^*_{11} = 0,$$

$$= -p_2 \alpha_1 + \alpha_6 - \alpha_6 p_2 + E^*_{11} - p_2 E^*_{11} = 0$$

Regroup all  $p_2$  on one side and the rest to the other side.

$$-p_2 \alpha_1 - \alpha_6 p_2 - p_2 E^*_{11} = -\alpha_6 - E^*_{11}$$

$$-p_2 (\alpha_1 + \alpha_6 + E^*_{11}) = -\alpha_6 - E^*_{11}$$

Common negative, therefore from  $-$  to  $+$

$$p_2 (\alpha_1 + \alpha_6 + E^*_{11}) = \alpha_6 + E^*_{11}$$

$$P^*_2 = \frac{\alpha_6 + E^*_{11}}{\alpha_1 + \alpha_6 + E^*_{11}}$$

### Second equation

$$E^*_{22} = -(1 - p_1) p_2 \alpha_2 + p_1 p_2 (\pi_1 - \alpha_2) + p_1 (1 - p_2) E^*_{12}$$

$$\frac{\partial E_{22}}{\partial p_2} = -(1 - p_1) \alpha_2 + p_1 (\pi_1 - \alpha_2) - p_1 E^*_{12} = 0.$$

$$-\alpha_2 + \alpha_2 p_1 + p_1 \pi_1 - p_1 \alpha_2 - p_1 E^*_{12} = 0$$

Group all  $P$  to one side and the rest to the other side.

$$\alpha_2 p_1 + p_1 \pi_1 - p_1 \alpha_2 - p_1 E^*_{12} = \alpha_2$$

$$p_1 \pi_1 - p_1 E^*_{12} = \alpha_2$$

$$p_1 (\pi_1 - E^*_{12}) = \alpha_2$$

$$P^*_1 = \frac{\alpha_2}{\pi_1 - E^*_{12}}$$

Nash equilibrium obtained is

$$P^*_1 = \frac{\alpha_2}{\pi_1 - E^*_{12}}, P^*_2 = \frac{\alpha_6 + E^*_{11}}{\alpha_1 + \alpha_6 + E^*_{11}} \quad (11)$$

## 6. Conclusion

This Paper has applied Game theory and decision tree analysis in order to model corporate political behaviour in Mauritius. The conclusion is as follows:

- The possibility of government enforcement of regulations is identified with the costs of esteeming efficient allocation of firms, the benefits securing the authority and its integrity, and their anticipations. The more the firms esteem the cost of efficient allocation  $\alpha_2$ , there is a greater probability of government control  $p^*_1$ . The greater the revenue  $\pi_1$  by ensuring the credibility, there will be less possibility of government control  $p^*_1$ . The bigger  $E^*_{12}$  is, the more noteworthy the willingness of firms' accentuation on efficient allocation of capital and the less the likelihood of government regulation  $p^*_1$  will be.
- The probability of firms' underscoring on efficient allocation of capital is associated with the supervision costs, estimated income, and the loss of credibility of the important

government officers. The greater the government enforcement and regulatory cost  $\alpha_1$  is, the smaller the  $p^*2$  is. The greater the estimated income of government officers in the primary stage  $E^*11$ , the greater the  $p^*2$ . The bigger the loss of government credibility  $\alpha_6$ , the greater the  $p^*2$ .

- (c) The probability of important government authorities mishandling power is related with the underlying components: the greater  $\sigma$  the higher the bribe  $\sigma\alpha_2$  and there is more possibility that government officials are tempted. Accordingly,  $p^*3$  will be greater. The higher the fines charged by the unjust government, the lesser the likelihood and probability  $p^*3$  of mishandling authority of government officials in light of the fact that the firms will start to append significance to efficient allocation of finance so as to keep away from fines and sentences.
- (d) The likelihood  $p^*4$  of corruption of firms is associated with the variables: when payment made to government offices are uneven with the sum they transform into the state treasury, the relevant government authorities will have more inclination to exhaust funds. Hence, the arrangement of rent seeking conduct between the state and firms will be invigorated. The more prominent the likelihood or probability  $p^*4$  of the gift/bribery of firms, the bigger the loss  $\alpha_5$  of government credibility coming about because of the mishandling of power and the smaller the likelihood of bribery of firms.

The present Paper lays emphasis on the theoretical underpinnings. The next part of this research estimates the above equations with real market data collected in order to empirically prove the corporate political associations in Mauritius.

---

## References

- Boubakri, N., Guedhami, O. Mishra, W. and Saffar, M., 2012. Political connections and the cost of equity capital, *Journal of Corp. Finance*, 18, pp. 541-559.
- Chan, K.C., Karolyi, A.G., Longstaff, F.A. and Sanders, S.B., 1992. An empirical comparison of alternative models of the short-term interest rate, *The Journal of Finance*, 47(3), pp. 1209-1227.
- Chen, C.J.P., Li, Z., Su, X. and Sun, Z., 2011. Rent seeking incentive, corporate political connection, and the control structure of private Firms: Chinese evidence, *Journal of Corporate Finance* 17, pp. 229-243.
- Claessens, S., Feijen, E., and Laeven, L. 2008. Political Connections and Preferential Access to 37 Finance: The Role of Campaign Contributions, *Journal of Financial Economics*, Vol. 88, pp. 554-580.
- Christian Leuz and Felix Oberholzer-Gee, 2006. Political relationships, global financing, and corporate transparency: Evidence from Indonesia, *Journal of Financial Economics*, Vol. 81, Issue 2, pp. 411-439.
- Chan, K.S., Dang, V.Q.T. and Yan, I.K.M. (b), 2012. Chinese Firms' Political Connection, Ownership, and Financing Constraints, *Economics Letters*, 115, pp. 164-167.
- Dombrovsky, V., 2008. Do Political Connections Matter? Firm-Level Evidence from Latvia, Available at: <<http://ideas.repec.org/p/bic/rpaper/3.html>>
- Faccio, M., 2006. Politically connected firms, *American Economic Review* 96, pp. 369-386.
- Faccio, M., 2010. Differences between politically connected and nonconnected firms: A cross country analysis, *Financial Management*, 39, pp. 905-927.
- Faccio, M., Masulis, R.W., McConnell, J.J., 2006. Political connections and corporate bailouts, *The Journal of Finance*. 61 (6), pp. 2597-2635.
- Francis, B.B., Iftekhhar, H. and Yun, Z., 2014. Political uncertainty and bank loan contracting, *Journal of Empirical Finance*, Elsevier, vol. 29(C), pp. 281-286.
- Hansen, W.L. and Mitchell, N.J., 2000. Disaggregating and Explaining Corporate Political Activity: Domestic and Foreign Corporations in National Politics, *American Political Science Review* 94 (December), pp. 891-903.
- Hill, M.D., Kelly, G.W., Lockhart, G.B. and Ness, R.A., 2013. Determinants and effects of corporate lobbying, *Financial Management*, 42(4), pp. 931-957.
- Hasan, I., Jackowicz, K., Kowalewski, O. and Kozłowski, Ł., 2013. Market Discipline during Crisis: Evidence from Bank Depositors in Transition Countries, *Journal of Banking & Finance*, 37, pp. 5436-51.

- Hasan, I., Jackowicz, K., Kowalewski, O. and Kozłowski, L., 2014. Politically connected firms in Poland and their access to bank financing, Bank of Finland, Institute for Economies in Transition.
- Houston, J., Jiang, L., Lin, C. and Ma, Y., 2014. Political connections and the cost of bank loans. *Journal of Accounting Research*, 52(1), pp. 193-243.
- Jiangtao, F., Daichi, S. and Yasuyuki, T., 2017. Can firms with political connections borrow more than those without? Evidence from firm-level data for Indonesia, *Journal of Asian Economics*, Vol. 52, Issue C, pp. 45-55.
- Khwaja, A.I., and Atif, M., 2004. The Value of Business Networks in Emerging Markets, Working Paper, Harvard University.
- Myers, S., Majluf, N., 1984. Corporate financing and investment decisions when firms have information that investors do not have, *Journal of Financial Economics*, 13, pp. 187-221.
- Peng, Y. and Yan, L., 2015. Political Connections, Discriminatory Credit Constraint and Business Cycle, *MPRA Paper* 61439, University Library of Munich, Germany.
- Richter, B., Samphantharak, K. and Timmons, J., 2009. Lobbying and Taxes, *American Journal of Political Science* 53:4, pp. 893-909.
- Stiglitz, J.E., 1999a. Public policy for a knowledge economy. Back to basics: Policies and strategies for enhanced growth and equity in post-crisis East Asia.
- Stiglitz, J.E., 1999c. Whither Reform? Ten years of transition, Annual World Bank Conference on Development Economics, April.
- Stiglitz, J.E., 1999d. Responding to economic crises: Policy alternatives for equitable recovery and development, The Manchester School, Special Issue.
- Xu, N., Xu, X. and Yuan, Q., 2013. Political Connections, Financing Friction, and Corporate Investment: Evidence from Chinese Listed Family Firms, *European Financial Management* 19, No. 4, pp. 675-702.
- Xu, N., Xu, X., Yuan, Q., 2011. Political connections, financing friction, and corporate investment: Evidence from Chinese listed family firms, *European Financial Management*.
- Xuesong, T., Yan, L., Qing, P., Jun, D. and Kam, C.C., 2016. Politically connected directors and firm value: Evidence from forced resignations in China, *The North American Journal of Economics and Finance*, 37, (148).



# A game of bank resolution

**Gabriel MITRACHE**

Bucharest Academy of Economic Studies, Romania

[gabriel.mitrache@gmail.com](mailto:gabriel.mitrache@gmail.com)

**Abstract.** *Before the 2008 financial crisis, credit institutions were aware that if they were large enough they would be rescued with tax-payers' money, an action also known as bail-out, what became known as "too big to fail". The BRRD proposes a legal framework that aims at eliminating the possibility of bailing-out credit institutions. This paper has the objective of assessing through a game theory analysis to what extent the BRRD has the potential to achieve its purpose and if there are identifiable improvements to this framework that could be considered for practical purposes or for a possible review of the framework.*

**Keywords:** banking, bank resolution, bank supervision, BRRD, game theory.

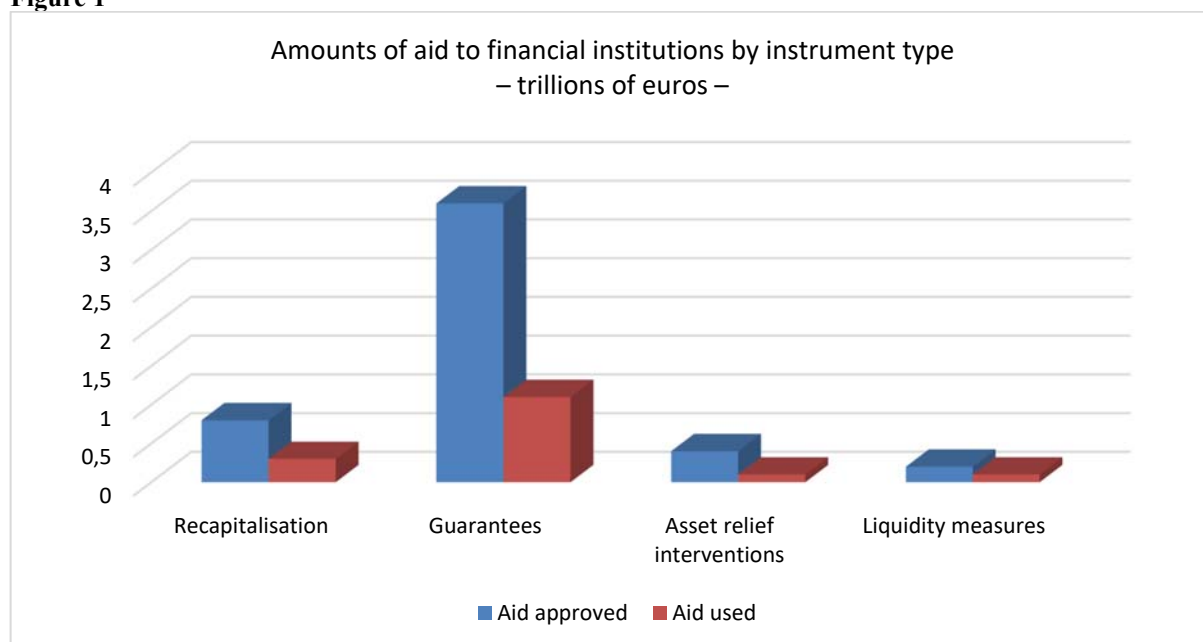
**JEL Classification:** D04, E61, G18, G21, G28, H12, K23.

## Introduction

Following the financial crisis of 2007-2008, the European Parliament introduced in 2014 through the Bank Recovery and Resolution Directive (BRRD), at European level, a legal framework with the main purpose to prevent public funds to be used for saving failing credit institutions, a salvage action also known as “bail-out”.

The economic cost of the financial crises has been significant, the median output loss (computed as deviations of actual output from its trend) reaching 25 percent of GDP in recent crises (Laeven and Valencia, 2010). A total of 5.1 trillion euro were approved by the EU as state aid in 2008-2012, out of which 1.6 trillion euro have been used – Figure 1 displays the European bank bailouts.

**Figure 1**



**Source:** European Commission State Aid Scoreboard 2012/billions of EUR – amount approved 1 October 2008 to 1 October 2012, amount used 1 October 2008 to 31 December 2011.

The BRRD framework aims at reducing drastically the possibility of further bail-outs and “should ensure that shareholders bear losses first and that creditors bear losses after shareholders”, as stated in paragraph 5 of the BRRD’s Recital and further in the Directive text.

The purpose of this paper is to assess, through game theory analysis, to what extent this framework covering bank resolution has the potential and ability to meet its purpose in practice.

## Review of existing information

While there is an enormous number of papers and articles concerning, at individual level, each one of the topics covered by the present paper – game theory, financial stability and bank failure & resolution – the approach hereby proposed is new and lightly explored, probably due to the relatively novelty of the Directive (2014) and data derived from its application being therefore limited and mostly uncertain.

In view of documenting for this paper, we could identify three articles that envisage a game theory analysis with regard to banking resolution: *A theory of failed bank resolution: Technological change and political economics* (DeYoung et al., 2012), *Strategic Games with Incomplete Information* (Trost, 2013) and *A macro approach to international bank resolution* (Schoenmaker, 2017).

The third article in the above enumeration examines the decision for the best resolution strategy (single point of entry or multiple point of entry – SPE vs. MPE) through game theory – it is of no relevance for our paper as it focuses on a specific type of negotiation during the resolution planning phase between the involved resolution authorities, a different topic altogether than our present purpose.

The second article in the above list studies with game theory analysis the strategies of two depositors of a likely to fail bank – their strategies, based on different sets of information (incomplete and asymmetric) scenarios with regard to their decisions to retreat their deposits or not – an assessment of how bank runs occur, pushed by a liquidity crisis driven by depositors. This article is also out of scope with regard to our purposes in the present paper.

The first article in the above list models the failed bank resolution process as a repeated game between a utility-maximizing government Resolution Authority (RA) and a profit-maximizing banking industry. The paper's conclusion is that due to limits of resolution tools and due to political & economic pressure incentives are created for the RA to bail-out failed complex banks; the inability of the RA to credibly commit to closing failing complex banks creates an incentive for bank complexity.

The analysis of DeYoung, Kowalik and Reidhil was performed before the introduction in 2014 of the BRRD framework. This new resolution framework works exactly towards increasing the limits and potentiating the powers of the resolution tools available for RA and towards decreasing the economic and political pressure for RA, with the purpose, among others, to eliminate bail-outs. The analysis in our paper will try to capture a conclusion if the BRRD has the potential to fulfil its intent and how could the DeYoung, Kowalik and Reidhil model be improved in order to offer a more palpable solution for avoiding bail-out solutions and ending the too-big-to-fail (TBTF) paradigm.

Through the BRRD, the main tools at RA's disposal consist of the bail-in<sup>(1)</sup>, a “smaller brother” for the bail-in in the form of the power to write down and convert capital instruments (both of which insure that losses are supported foremost by shareholders and creditors, therefore limiting possibility and amount of bail-out). Secondly, as institutions are subject of resolution plans and are required to provide reports, in a going concern basis (EBA, 2017), that would facilitate the valuation of the banks, hence reducing to a certain degree the difficulties posed by complex institutions as presented in DeYoung et al. Reidhil model.

## Analysis

### 3.1. Bank failure, contagion and liquidity crunch

One of the core principles of a free economy is that failing of economic agents, even if they are credit institutions, cannot be avoided and should not be avoided in order to allow the exit from the market of underperforming players. Salvaging failing institutions can be translated as rewarding the weakest performers in the economy and not the best-performers.

Banks are a special kind of institutions in the sense that chiefly their cash base is established by depositors' funds (depositor becoming bank's creditors); banks link through their payment services different economic players enabling fast and reliable trading; last but not least most of banks' assets are very difficult to value (due to their complexity), more so in an economic crunch (high volatility of assets) and in a short time-frame. As such, authorities have plenty of incentives to save a failing credit institution in order to preserve the market functioning, trust among participants and preserve depositors' funds, further avoiding contagion economy wide. Several articles area treating in detail the statements from this paragraph. Below are some concluding excerpts of these articles:

What happens when a bail-out occurs: “the financial market liquidity of today is preserved at the cost of increasing the moral hazard incentives of financial market participants in the future. In other words, policymakers trade market discipline in exchange for market liquidity” (DeYoung et al., 2012).

“Since [everyone] has expected a bailout when Lehman Brothers failed, bailout which did not occur, market participants began to wonder if authorities have the power to rescue financial institutions that are collapsing and hence panic installed, leading to a second wave of collapses” (Cochrane, 2010).

“The more complex the financial instrument, the harder it is to evaluate it. Credit Rating agencies, being paid for their evaluation by the issuer, hence in a questionable moral hazard situation, have proceeded to issuing positive recommendations of the financial instruments” (Căpraru, 2017).

“The players in the market are interconnected. Due to the difficulty in evaluation, it cannot be fully assessed what is the risk position of any participant and what would be the actual loss given its default. This is part of the contagion effect: financial companies are not aware which of their counterparties hold substantial risk and hence stop conducting business with them” (BNR, 2008).

“Also, there seem to be different causes to the failure of a bank, and its spread through contagion to the system, such as macroeconomic failures, deficiencies of financial sector supervision and regulatory policies and practices, excess of poorly understood innovations in financial engineering and imprudence of large private financial institutions” (Truman, 2009).

### 3.2. Liquidation, bail-out or resolution action – the practice

Although the BRRD framework is clear that bail-outs should be quasi non-existent, closing through insolvency procedure should be the norm and tools for resolution actions are well defined and should be enforced, the actual bank failing occurrences show that high stress was exerted on RA, forcing them to ponder the economic and political pressure and the market discipline versus using public funds, as defined in the DeYoung, Kowalik, Reidhil model.

Recent examples of such occurrences are of Banca Popolare di Vicenza S.p.A. and Veneto Banca S.p.A. in Europe: ECB made a clear statement in June 2017 of the failing of the Italian banks; in the same day, SRB although agreed to ECB’s failing determination, has concluded that for these two banks, resolution action is not warranted in the public interest. However, the Italian government could have not afforded that hundreds of thousands of depositors would, at least temporarily, lose their access to their funds and hence resorted to a scheme that allowed for the business transfer to an acquirer, conditional of the injection of cash and of the provision of guarantees by the Italian government (European Parliament, 2017), so to an extent applying bail-out as a result of economic and political pressure in the face of a liquidity squeeze. The cash amount injected by the Italian government amounted to EUR 4.78 billion in addition to EUR 6.8 billion non-cash/guarantees. The actions described in the cases of the two Italian banks are not singular and are emphasized by several public statements out of which some passages are extracted below.

“In view of the existing mismatch between European oversight and national liability, the objectives and interests of the several stakeholders involved are not aligned. As of now, we can ponder whether the intrinsic goal of preserving financial stability is being superseded by a self-protective interpretation of the European institutions’ mandate” (Costa, 2017).

“The recent developments in Spain and Italy showed that investors will shy away from acquiring banks in an early stage of distress and wait for the opportunity to bid for these banks in a resolution context at distressed prices or under liquidation proceedings. At the same time, in the current context where MREL<sup>(2)</sup> compliance is far from being attained, whenever an event

changes risk perception, short-term investors in that institution's 'bail-in-able' securities will trample over each other to reach the exit before bail-in. As they form a disorderly queue at the exit, the price of these securities will collapse, triggering a series of contagious mechanisms including rating downgrades and ultimately bank runs, potentiated by the corporate deposit base" (Costa, 2017).

"Faced with collapsing prices, and declining confidence, the rating agencies will downgrade bail-in securities. More stoic holders of bail-in securities who had resisted the urge to sell in the first wave will now be forced to sell as a result of investment mandates limiting the holdings of low-rated instruments. (...) However, there will be wider knock -on effects where these instruments are being used as collateral for other instruments or where their prices are used to price other, less liquid, assets. Hedge fund clients will bolt for the exit, forcing hedge funds to raise liquidity by selling otherwise unconnected assets. These indirect effects will give an impression that strong, hidden undercurrents are driving financial markets, which will cause aggregate uncertainty to rise, triggering a general risk aversion and further liquidation of assets. There are many avenues through which the correlation of asset prices tends towards 1 during a period of stress. Collapsing asset prices will undermine the position of banks. Bail-in securities will bring forward and spread a crisis, not snuff it out." (Persaud, 2014).

"Prohibiting bailouts is not necessarily desirable, however: it induces intermediaries to become too liquid from a social point of view and may, in addition, leave the economy more susceptible to a crisis" (Keister, 2010).

As shown above, both theoretic literature, as well as practical cases show that short-run political or economic pressure support a too-big-to-fail (TBTF) policy; this inability of regulators to credibly commit to closing failed complex banks encourages continued or increased bank complexity, a conclusion presented also in the original game developed by DeYoung, Kowalik and Reidhil.

### 3.3. Modelling the game

The approach proposed in this paper considers modelling some other specifications to the game introduced by DeYoung, Kowalik and Reidhil in order to align it with the BRRD framework and to be able to offer applicable solution to the bail-out issue.

One of the modifications we propose to the original game is to introduce the size of an institution (group) in addition to its complexity as a parameter of the game, more exactly as an outcome for the bank's action. The original model discarded size as having relevance for the decision of the authorities; we believe that size could actually be directly linked to the economic and political pressure that RA face when deciding to bail-out or not. The complexity of an institution is a direct driver for the time needed to perform an evaluation and for the confidence in the evaluation (that could be translated in an additional discount in case of sale). The size of the bank implies that there will be more counterparties involved, more depositors and creditors that would bear losses and hence contribute to a potential liquidity crunch.

In their 2014 paper, Laeven, Ratnovski and Tong find that systemic risk increases with bank size. Their results indicate that one standard deviation increase in total assets increases the bank's contribution to systemic risk by about one third its standard deviation when measured by CoVAR, and by half its standard deviation when measured by SRISK.

By introducing this measure of a size, there are four states that a credit institution can be:

**Table 1.** *Proposal on categorising banks based on size and complexity.*

Size	Complexity		
		Simple	Complex
	Small	A	B
	Large	C	D

To better define size and complexity, the following elements are taken into considerations:

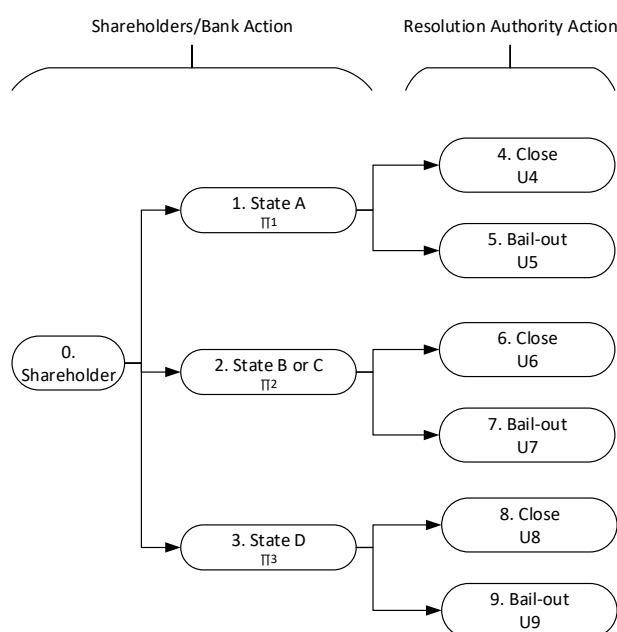
- Size is measured by total liabilities of the bank, as ultimately the bank (and indirectly the accountable authorities) are responsible for safeguarding and preserving the values entrusted by the depositors and creditors.
- Complexity is measured by the proportion of complex assets in total assets. These are the assets that require more time and effort to be valued and due to the specific of these type of uncommon assets might be subject to higher discount rates in case of a fire-sale. We follow the definition of complex assets introduced in the original model: complex loans are difficult to value and the complex loan production process (e.g., originate, securitize and sell; financial market rather than deposit funding; off-balance sheet obligations) is opaque and difficult to unwind in bankruptcy and hence generates larger failure externalities.

RA would rather want all banks to be in A state, that would be most easily to allow for effortless and without economic contagion liquidation. Banks, on the other hand, would like to be in D state that allows for synergies and more efficient cost allocations, cash-flow distributions (as a matter of size) and more profitable output (as a matter of complexity). The D state would most likely guarantee a bail-out, also the shareholders would be first subject of bail-in, so the possibility of a bail-out is no longer a driver for shareholders.

States B & C are borderline between the A and D states. If we consider the arguments taken in the original model, that simple institutions, no matter how large, would allow for rapid and efficient liquidation, inducing minimum tension in the real economy, C state also suits RA (although not ideal). Similarly, if a bank is complex but small (state B), its failing would have limited contagion effect, so liquidation could still be applicable. RA would apply liquidation in states B & C with probability  $p_1$ , whereas in state A liquidation is the only action taken by RA. In state D, RA would apply liquidation (closure) with probability  $p_2$ , where  $p_1 > p_2$ .

Another alteration to the original game design would be in the equation (3), where the expected bailout subsidy  $\phi b$  would now be zero, hence BRRD clearly states that before applying any resolution action, shareholders and creditors should bear losses, and a minimum of 8% the bank's liabilities and share capital should be used to cover the losses before accessing any kinds of state aid. These provisions, in our view, reduce to 0 the bailout subsidy.

**Figure 2.** Game tree for bank and resolution authority possible actions



Where:

Profits of the bank fall under the condition:  $\Pi^1 < \Pi^2 < \Pi^3$

Utilities for the Resolution Authority fall under the conditions:  $U_4 > U_5$ ;  $U_6 \sim U_7$ ;  $U_9 > U_8$ .

The Banks have a “dominant strategy”, respectively to choose the D state that offers the highest profit. As there is no correlation between size & complexity and probability of default (there cannot be attributed a higher chance of default to D state bank than to an A state bank) and given that under closure and bail-out, shareholders are either way subject of bail-in, banks have a dominant strategy, choosing the same path irrelevant of what RA’s action.

RA’s strategy consists of a “best reply strategy”: liquidation with almost certainty<sup>(3)</sup> in State A of a bank, closure with probability  $p_1$  in States B and C of a bank and closure with probability  $p_2$  in case the bank is in State D.

The game is of imperfect information due to the fact that the actions of the Resolution Authority are not certain and depend on the moment’s incentive for policy enforcement or liquidity preservation.

The BRRD framework tries to foster a dominant strategy for RA represented by the closure action: bail-out to be left out and use of resolution actions if in the public interest. As we have shown above, the application of resolution tools could also require public funds (even if limited to state guarantees). The larger and the more complex the entity, the higher the probability that public funds (in a way or another) would be used (maybe only temporarily) to solve the failing institution.

The question, in these circumstances, is how to incentives the banks to play “State A”, action that would allow for an equilibrium in dominant strategies, being also in the public interest in terms of resolving banks without utilizing public funds. Equilibrium in dominant strategies before the BRRD would have been “State D”, with RA playing bail-out.

The response to this question comes from different resolution authorities’ proposals: Bank of England’s ring-fencing proposal, Deutsche Bundesbank’s view on “small banking box” and the Federal Reserve Bank of Minneapolis’ Plan to end too-big-to-fail (TBTF).

Bank of England’s proposal is straightforward and proposes a structural reform, also known as ring-fencing, with the purpose to separate banks’ retail banking activities from their wholesale and investment banking activities. This will address both size and complexity matters discussed above, forcing banks to adopt the A state action. While FED Minneapolis’ plan is much deeper and has more proposed actions, two fundamental aspects address the question raised above: individual large banks that are systemically important are subject to extraordinary increases in capital requirements, leading many to fundamentally restructure themselves and reduce unnecessary regulatory burden on smaller banks. These are two actions that force and incentivize the banks to choose the State A. Although this action does not lead to a 100% closure action from RA in case of failing, the institution will be more easily resolvable and would highly decrease any economic and political stress on the RA with regard to its action.

## Conclusion

Banking is probably the industry with the highest rate of bail-outs. Governments are reaching for legal frameworks that would discourage such salvage actions that require public financing, however, the path is not clear. If the past literature showed that resolution tools capable of dealing with failing banks were needed, recent bank failures show that not the actual resolution technologies are the limit, but rather the economic and political pressure drives the resolution authorities’ decision.

Through a game theory approach we showed that banks are incentive by their profits into reaching complex and large forms, both of which inhibit liquidation or resolution action by driving a higher pressure from the point of view of economic and political pressure on the resolution authorities. In our view, the response should be transposed as a requirement from the

regulatory perspective that would require banks to have simpler and smaller structures (coercive approach) and also encourage this direction through different facilities offered to smaller and simpler banks. Such a hybrid approach is proposed by FED Minneapolis, while a pure coercive approach is proposed by the Bank of England.

While there might be other approaches from the perspective of the authorities, the result should be the same: banks should have smaller and simpler structures. Measures to prevent failure cannot be a panacea for the complexities of the banking activity and, in a free market, underperforming players should be allowed to exit the market. For banks, these exists should occur with minimal externalities, a desideratum that can be achieved by means of limiting the size and the complexity of each bank.

---

## Notes

- (1) The opposite of the bail-out, where the funds for stabilizing the failing bank come from within instead of from the outside of the institution.
- (2) Minimum Requirement for own funds and Eligible Liabilities
- (3) It can be argued that under severe systemic stress, RA could opt to save even small /un-complex institutions, hence a probability of 1 cannot be attributed even in this scenario.

---

## References

- Bernard, B., Capponi, A. and Stiglitz, J., 2017. Bail-ins and bailouts: Incentives, connectivity, and systemic stability, VoxEU.org
- Cochrane, J.H., 2010. Lessons from the Financial Crisis, University of Chicago – Booth School of Business; Hoover Institution, National Bureau of Economic Research (NBER).
- Costa, C., 2017. Keynote speech- The Joint NBR and IMF Financial Stability Seminar (11<sup>th</sup> edition), The day after tomorrow: the future of financial intermediation, Bucharest, 27 October 2017, available at <<https://www.bportugal.pt/sites/default/files/anexos/documentos-relacionados/intervpub20171027.pdf>>
- Keister, T., 2012. Bailouts and Financial Fragility, Federal Reserve Bank of New York Staff Reports, no. 473, September 2010; revised July 2012, available at <[https://www.newyorkfed.org/medialibrary/media/research/staff\\_reports/sr473.pdf](https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr473.pdf)>
- Leaven, L., Ratnovski, L., Tong, H. and Bank, S., 2014. Capital Requirements, and Systemic Risk: Some International Evidence, IMF, available at <<https://www.imf.org/external/pubs/ft/sdn/2014/sdn1404.pdf>>
- McNulty, D., consulted 2017. The Basics of Game Theory, available at <<https://www.investopedia.com/articles/financial-theory/08/game-theory-basics.asp>>
- Persaud, A., 2014. Why Bail-In Securities are Fool's Gold, Policy Brief, Peterson Institute for International Economics.
- Robert DeYoung, Michal Kowalik and Jack Reidhill, 2013. A theory of failed bank resolution: Technological change and political economics, *Journal of Financial Stability* available at <<http://risk.econ.queensu.ca/wp-content/uploads/2013/10/DeYoung-Kowalick-and-Reidhill-2013-JFI-forthcoming.pdf>>
- Schoenmaker, D., 2017. A macro approach to international bank resolution, *Bruegel Policy Contribution*, Issue 20, July, <<http://bruegel.org/wp-content/uploads/2017/07/PC-20-2017-100717.pdf>>
- Truman, E., 2009. Lessons from the Global Economic and Financial Crisis, Keynote address at the conference “G-20 Reform Initiatives: Implications for the Future of Regulation” co-hosted by the institute for Global Economics and the International Monetary Fund in Seoul, Korea.
- Ubide, A., 2008. Anatomy of a Modern Credit Crisis, *Estabilidad Financiera*, no. 14, Banco de España.
- Trost, M., 2013. Microeconomics I: Game Theory, Lecture 8: Strategic Games with Incomplete Information”, December, available at <[https://www.uni-erfurt.de/fileadmin/user-docs/Angewandte\\_Mikrooekonomie/WS2013\\_14/Game\\_Theory/Game\\_Theory\\_L8\\_Incomplete\\_Information.pdf](https://www.uni-erfurt.de/fileadmin/user-docs/Angewandte_Mikrooekonomie/WS2013_14/Game_Theory/Game_Theory_L8_Incomplete_Information.pdf)>



- Banca Națională a României, 2008. Raport asupra stabilității financiare, București, available at <<https://www.bnr.ro/PublicationDocuments.aspx?icid=6711>>
- Bank of England, Structural Reform, available at <<https://www.bankofengland.co.uk/prudential-regulation/key-initiatives/structural-reform>>
- Bank of England, The implementation of ring-fencing: reporting and residual matters – responses to CP25/16 and Chapter 5 of CP36/16, available at <<https://www.bankofengland.co.uk/prudential-regulation/publication/2017/the-implementation-of-ring-fencing-reporting-and-residual-matters-responses-to-cp2516-and>>
- Directive 2014/59/EU of the European Parliament and of the Council of 15 May 2014 establishing a framework for the recovery and resolution of credit institutions and investment firms and amending Council Directive 82/891/EEC, and Directives 2001/24/EC, 2002/47/EC, 2004/25/EC, 2005/56/EC, 2007/36/EC, 2011/35/EU, 2012/30/EU and 2013/36/EU, and Regulations (EU) No 1093/2010 and (EU) No 648/2012, of the European Parliament and of the Council.
- European Banking Authority, EBA consults on reporting for resolution plans, available at <<https://www.eba.europa.eu/-/eba-consults-on-reporting-for-resolution-plans>>
- European Central Bank, ‘Failing or Likely to Fail’ Assessment of Veneto Banca Società per Azioni, available at <[https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.2017\\_FOLTF\\_ITVEN.en.pdf](https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.2017_FOLTF_ITVEN.en.pdf)>
- European Parliament, BR I E F I N G, The orderly liquidation of Veneto Banca and Banca Popolare di Vicenza, available at <[http://www.europarl.europa.eu/RegData/etudes/BRIE/2017/602094/IPOL\\_BRI\(2017\)602094\\_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2017/602094/IPOL_BRI(2017)602094_EN.pdf)>
- Federal Reserve Bank of Minneapolis, The Minneapolis Plan to End Too Big to Fail (December 2017), available at <<https://www.minneapolisfed.org/~media/files/publications/studies/endingtbtft/the-minneapolis-plan/the-minneapolis-plan-to-end-too-big-to-fail-final.pdf?la=en>>
- Financial Stability Board, Recovery and Resolution Planning for Systemically Important Financial Institutions: Guidance on Identification of Critical Functions and Critical Shared Services, available at <[http://www.fsb.org/wp-content/uploads/r\\_130716a.pdf](http://www.fsb.org/wp-content/uploads/r_130716a.pdf)>
- IMF Working Paper, Research Department, Resolution of Banking Crises: The Good, the Bad, and the Ugly Prepared by Luc Laeven and Fabian Valencia, June 2010, available at <<http://www.imf.org/external/pubs/ft/wp/2010/wp10146.pdf>>
- Single Resolution Board, The SRB will not take resolution action in relation to Banca Popolare di Vicenza and Veneto Banca, available at <<https://srb.europa.eu/en/node/341>>