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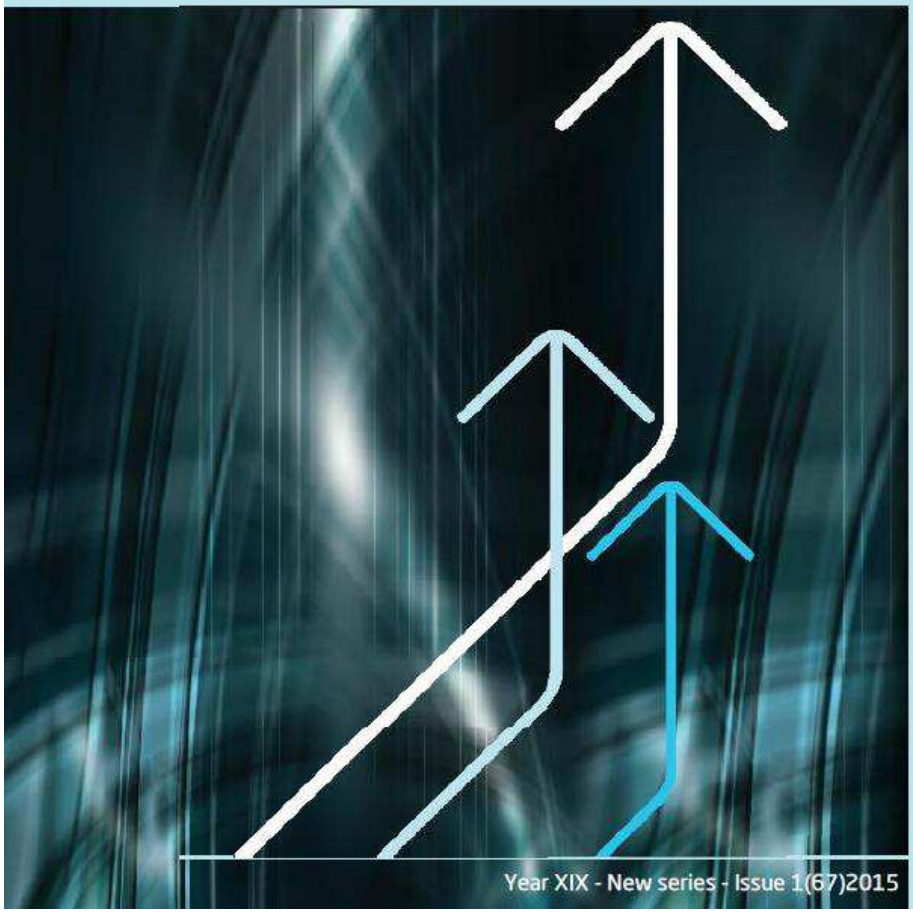

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“VICTOR SLĂVESCU” CENTRE FOR FINANCIAL
AND MONETARY RESEARCH

FINANCIAL STUDIES

ROMANIAN ACADEMY
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CONTENTS

AN OPTIMALITY ASSESSMENT OF THE FISCAL CONSOLIDATION PROCESS INITIATED BY ROMANIA IN 2010

Bogdan Andrei DUMITRESCU, PhD*

Abstract

The manifestation of the economic and financial crisis consequences in Romania at the end of 2008 coincided with the accumulation of severe imbalances in terms of public finances position and current account balance. The inevitable decision of the Romanian authorities to implement a program of fiscal consolidation in 2010 raised the question of its optimality in terms of size and composition, namely the mix between the modification of different categories of revenues and expenditures. The present study calculated the short and medium term need for fiscal adjustment existent in 2009 and also compared the structure of the chosen fiscal consolidation package with the one indicated by the best practices from the literature. The paper concludes that, although the fiscal consolidation program has been successful in correcting the fiscal imbalances, its quality in terms of composition was an average one.

Keywords: fiscal consolidation, economic growth, equity, crisis management

JEL Classification: H12, H23, H68

1. Introduction

The economic and financial crisis has had severe consequences in Romania that were amplified by the accumulated domestic macroeconomic imbalances, especially in terms of public finances position and current account balance. The low level of public debt existing in Romania in 2008, respectively 13.2 % of GDP, allowed postponing the necessary measures to adjust the budget deficit that reached in 2009 a record high of 8.9% of GDP. Given the exponential growth of both public and private funding needs amid a hostile macroeconomic environment and confronted with prohibitive

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financing costs, Romania decided to implement in 2010 a comprehensive fiscal consolidation program aimed to correct the accumulated imbalances, even if this decision was equivalent to continue practicing pro-cyclical fiscal policies.

It arises the question to what extent the fiscal consolidation program decided in 2010 was an optimal one in terms of solving the accumulated budgetary imbalances, of the proposed fiscal consolidation pace and implicitly in terms of stabilizing the public debt to GDP ratio, but also from the perspective of ensuring an optimum in terms of the costs associated with such a program - such as for example the negative impact on economic growth and social equity. In this regard, the literature shows that the structure of the fiscal adjustment program is particularly relevant, namely the choice of the budgetary aggregates by which to reduce the budgetary deficit. This research aims to contribute to the optimality analysis of the fiscal consolidation program initiated by Romania in 2010 and, if it is the case, to propose alternative approaches by identifying the size of the necessary fiscal consolidation existing at the time, by investigating the literature regarding best practices for implementing a fiscal adjustment program calibrated in the case of Romania and by comparing them with the actual way that the deficit reduction was achieved in Romania during 2010-2013.

2. An assessment of the size of the fiscal consolidation need existing in Romania in 2009

The calculation of the fiscal consolidation need is a difficult task depending on many factors related to the specific imbalances accumulated by a country – fiscal and/or in the financial sector or regarding the current account balance - which is also affected by numerous uncertainties considering the fact that it is significantly influenced by the medium and long term projections of the key macroeconomic variables.

Sutherland et al. (2012) show that one can distinguish between a short to medium term fiscal consolidation need generally oriented to stabilize the debt to GDP ratio and a long-term fiscal consolidation need which targets reducing debt to a certain threshold. The authors also show that the mix between the two dimensions of a process of fiscal consolidation - short term and long term - depends on the trade-off regarding short-term stabilization, namely the impact on economic growth given by the fiscal multipliers, the effect on long-term economic growth, the redistribution effects of such a process and also on aspects related to intergenerational equity.

In essence, long-term fiscal policy should have as an anchor a certain level of public debt. This level can influence the long-term economic growth in view of the findings from the literature which have shown that a debt level above a certain threshold has negative consequences for real GDP growth. For example Reinhart and Rogoff (2010) and Cecchetti et al. (2011) showed that for developed countries, the economic growth rate is about 1 percentage point lower if the public indebtedness is higher than 90% of GDP and the impact is amplified non-linearly as this level increases. Moreover, debt intolerance for developing countries has the potential to manifest itself at much lower levels as shown by Reinhart et. al (2003), and these countries cannot afford the same level of debt as developed countries given for instance the much lower access to finance. There are also adjacent factors limiting the ability to accumulate debt for developing countries such as higher volatility of the macroeconomic variables, the usually lower average maturity of the public debt, higher share of foreign currency denominated debt, all of these increasing their vulnerability to various economic shocks.

The target level of public debt should be a prudent one in order to allow an optimal response to shocks, the recent experience of EU countries showing clearly that a steep increase in indebtedness can occur abruptly in the conditions of a severe economic crisis and/or if the need to intervene with public funds to rescue financial institutions arises. In Europe, a strong anchor on public indebtedness is given by the 60% of GDP threshold stipulated in the Maastricht Treaty, which is in theory enough to allow the existence of a fiscal space when needed. However, there are enough reasons for which this limit is too high for emerging economies like Romania. Moreover, to formally recognize this, Romania's fiscal responsibility law, through the changes operated in 2013, sets public debt thresholds that trigger a series of corrective changes at 50%, 55% and respectively 60% of GDP.

In view of the situation in Romania from 2009, the economic and financial crisis has led to recording a real GDP growth of -7.1 % and the correction of the severe accumulated fiscal imbalances has been delayed in order to allow the automatic stabilizers to mitigate to some extent the effects of the crisis. Romania's chance was represented by the very low level of public debt at the end of 2008, respectively 13.2% of GDP which allowed the delay to a certain extent of the discretionary measures implementation designed to reduce the budgetary deficit that reached a level of 8.9% of GDP in

2009. In these circumstances, the public debt trajectory was obviously pointing to a steep increase, the advance 10 pp. of GDP recorded in 2009 only being expected to continue.

Given the low starting point for the public indebtedness, but also its steep upward trend, identifying the fiscal consolidation need is reduced to determining the fiscal gap over the short and medium term given the significant space against a possible public debt target consistent with long-term economic growth, albeit at a level significantly lower than that stipulated by the Maastricht Treaty. However, medium-term debt stabilization was not without challenges given the very high budgetary deficit recorded in 2009 and the domestic and international macroeconomic framework. Basically, forecasting the evolution of public debt to GDP ratio is based on the debt dynamics equation that uses as inputs the medium-term projections for the economic growth, the interest paid on public debt and the inflation rate. Thus, identifying the fiscal consolidation need is affected both by the uncertainty associated with these forecasts, but also by the possible links between the determinants of the public debt to GDP ratio.

In this paper, the fiscal consolidation need existing in Romania in 2009 was determined based on the following hypothesis. First, it should be noted that, as the analysis is an *ex-post* one, for simplicity it was assumed that the necessary macroeconomic variables have been forecasted to the actual recorded level. Second, the medium term objective of a fiscal consolidation process is to stabilize the public debt; it is clear that, given the starting point which is represented by very high budgetary deficits, the adjustment was very difficult to occur in just a year or two. For example, in order to stabilize public debt in 2010 a primary surplus of about 0.4% of GDP would have been required which is equivalent to an improvement in the primary balance of 7.8% of GDP over the previous year, but such a development was virtually impossible in practice without very high economic and social costs. It is reasonable to consider a medium term adjustment of the budgetary deficit, with the objective to stabilize public debt in 5 years for example. Starting from the public debt equations, as synthesized by Cafiso (2012), several scenarios of fiscal consolidation starting with 2010 have been built, with an average fiscal consolidation pace in terms of reduction in the primary deficit set at 0.5%, 1%, 1.25% and respectively at 1.5% of GDP. More specifically, the annual change in public debt as a percentage of GDP will be given by:

$$\Delta b_t = -w_t + \left(\frac{1+i_t}{(1+\pi_t)*(1+\eta_t)} - 1\right) * b_{t-1},$$

where b_t designates the public debt at the time t, w_t is the primary surplus , i_t represents the nominal interest rate paid in year t for the public debt, π_t designates the inflation rate measured by the GDP deflator while η_t is the real economic growth rate in year t.

The stock-flow adjustment was assumed to be zero, and the values of the macroeconomic variables are the ones actually realized, as this is an *ex-post* evaluation. Given the above, the primary deficit and public debt were forecasted at the end of the 5 years period, while it is of interest to check if the debt has been stabilized. The results of these calculations can be found in the table below:

Table 1

The primary deficit and public debt in various fiscal consolidation scenarios with 2010 as the starting point

Annual reduction in the primary deficit (% of GDP)	0.50	1	1.25	1.5
Projected primary deficit at the end of 2014 (% of GDP)	4.90	2.4	1.15	-0.1
Public debt stabilization by the end of 2014	no	no	Yes	yes
Public debt at the end of 2014 (% of GDP)	42.38	39.88	38.63	37.38
Change of the public debt compared to the 2014 level (% of GDP)	3,87	0.9	-0.58	-2.07

Source: own calculations

Thus, the fiscal consolidation need can be assessed to a fiscal consolidation pace of about 1.25% of GDP/year, which appears as sufficient in order to stabilize public debt in 2014 and to initiate a trend of reducing it from 2015 onwards. It should be made clear that the actual data on the stock of public debt contain elements included in the so called stock-flow adjustment such as the one arising from the Ministry of Public Finances decision to build a cash reserve by meeting in advance the future financing needs or the one resulting

from the depreciation of the national currency; however, for the present analysis, these elements can be ignored. In conclusion, in the 2010-2014 period a need to improve the fiscal balance by approximately 6.25% of GDP has been identified, corresponding to an annual pace of 1.25% which should be sufficient in order to stabilize public debt at a level below 40% of GDP.

Regarding the actual pace of fiscal consolidation, beyond the identified average for 5 years, Romania's obligations arising from EU membership must be also be taken into account. The budgetary deficit from 2008 of over the 3% of GDP, surpassing the threshold stated in the Maastricht Treaty led to placing Romania in the excessive deficit procedure, with a deadline to correct the budgetary imbalance until late 2012. In this context, the pace of fiscal consolidation ought to be about 2% per year in 2010-2012, corresponding to a reduction in the headline deficit from the 8.9% of GDP level recorded at the end of 2009 to a level below 3%. Afterward, the annual pace of fiscal consolidation could be of 0.5 % of GDP in structural terms consistent with the provisions of the corrective arm of the Stability and Growth Pact under that Romania would actually fall subsequently to the reduction of the budgetary deficit below the threshold of 3%.

It can be observed that the time schedule for Romania to exit from the excessive deficit procedure is equivalent to achieving in three years the amount of fiscal consolidation required to stabilize debt, previously determined for a time horizon of 5 years. From a perspective of the need for fiscal consolidation, the best option seemed to be a gradual reduction on a 5 year horizon in the budgetary deficit at a rate of 1.25 % of GDP per year followed by smaller adjustments, corresponding to an annual pace of 0.5% of GDP in structural terms in order to achieve the medium-term objective. Such a scenario would have necessarily imposed prior negotiations with the EU institutions to extend the period allowed for the budgetary imbalances correction.

3. Best practices from the literature regarding the implementation of an optimal fiscal consolidation program

Beyond assessing the need for fiscal consolidation, it is of utmost importance the way to achieve it, respectively the mix between spending cuts and tax increases, but also identifying the budgetary aggregates where to operate modifications from the perspective of an optimal compromise between ensuring a

sustainable budgetary and/or current account balance, equity and short and long-term impact on economic growth.

Applying a DSGE model for Hungary, Guerson (2013) analyzes the short and long-term impact on real GDP dynamics of a fiscal consolidation package and concludes that it is preferable that this process takes place through current expenditure cuts (e.g. spending on pensions, spending on goods and services) while the least indicated variant is the reduction in investment spending. Increasing taxes is somewhere between these two extremes, but here also, the chosen instrument matters. Thus, taxes on capital and labor have the most significant negative impact on long-term real GDP growth while the consequences of an increase in consumption taxation are somewhat more reduced.

Geng (2013), studying how fiscal consolidation was implemented in Lithuania in the aftermath of the economic and financial crisis, argued that the structure of a package of fiscal adjustment should be influenced by the specific situation of a country as Lithuania for example is characterized by the lowest ratio to GDP of budgetary revenues from the EU. In this sense, it is logical to implement measures to increase revenues and preferable in this respect are the tax base broadening, increasing property taxes and promoting greater progressivity in the tax system.

Ball et al. (2013) analyzing the consequences of a fiscal consolidation process on income distribution based on past experiences from the period 1978-2009 in 17 OECD countries conclude that fiscal adjustments are usually accompanied by significant redistributive effects, increasing inequalities as the process is contributing to a lower share of wages in total income and to higher long-term unemployment. The authors also show that reducing spending has on average a less negative impact on income distribution than tax increases. The authors recommended implementing alongside with the fiscal consolidation package a set of measures aimed at reducing the impact on income distribution in the economy possibly accompanied by a flexibility of the fiscal adjustment program depending on future economic developments.

Cournède et al. (2013) developed a hierarchy of the budgetary aggregates in terms of their suitability for use in a process of fiscal consolidation considering their impact on short- and long-term economic growth, equity and the current account balance, each criterion being assigned an equal weight. Thus, beyond the impact on real GDP, a fiscal consolidation process that is perceived as unfair

has a higher risk of being reversed while many countries facing fiscal imbalances are also characterized by high current account deficits - thus, by the budgetary deficit reduction, an increase in national saving will occur with positive impact on the current account. The proposed hierarchy based on the application of these criteria is as follows, the ordering starting from the budgetary aggregates preferably to be used 1) Subsidies; 2) Pensions; 3) Other government consumption, unemployment benefits, environmental taxes and other property taxes; 7) Sickness and disability payments, recurrent taxes on immovable property and sales of goods and services; 10) Consumption, personal income and corporate income taxes; 13) Public Investment, health services; 15) Family policy and social security contributions; 17) Education.

In conclusion, a program of fiscal consolidation must be a compromise between the need to stabilize debt in the short and medium term and the need to reduce it in the long-term and the impact of the fiscal adjustment on economic growth, equity and income distribution and the current account balance. Choosing an optimal mix between spending cuts and tax increases and especially identifying the budgetary aggregates based on which to achieve the budgetary deficit and public debt reduction are of utmost importance in order to minimize the inevitable negative economic and social consequences of such a process.

4. The composition of the fiscal consolidation program initiated in Romania in 2010 - achievements versus best practices

The question arises to what extent the fiscal consolidation process in Romania from the period 2010-2013, which resulted in reducing the general government deficit from 8.9% of GDP in 2009 to 2.2% of GDP in 2013, was consistent with the best practices identified in the literature with regard to its structure. In this respect, the tables below show the evolution of revenues and spending in Romania in 2009-2013, with table no. 2 containing the budgetary expenditures in economic classification while table no. 3 refers to their functional classification as both are needed in order to assess if the chosen fiscal adjustment instruments are consistent with the criteria stated above.

Table 2

The evolution of budgetary revenues and expenditures in Romania in 2009-2013 according to ESA95 (% of GDP)

	2009	2010	2011	2012	2013	Changes 2013 compared to 2009
Total revenue	31.8	33.0	33.7	33.4	32.9	1.2
Fiscal revenue	17.1	17.7	19.0	19.1	18.6	1.5
Indirect taxes, out of which:	10.7	11.8	13.0	13.1	12.7	2.0
VAT	6.5	7.5	8.6	8.4	8.3	1.7
Excises	3.1	3.0	3.1	3.1	4.3	1.2
Direct taxes, out of which:	6.4	6.0	6.1	6.0	5.9	-0.5
Personal income tax	3.4	3.2	3.3	3.4	3.4	-0.1
Corporate income tax	2.6	2.3	2.3	2.1	2.0	-0.6
Social security contributions	10.0	9.3	9.0	8.8	8.7	-1.4
Other current revenue	1.6	2.6	2.1	2.4	2.6	1.0
Total expenditure	40.6	39.6	39.2	36.4	35.2	-5.5
Intermediate consumption	6.3	5.4	5.7	5.8	5.6	-0.7
Compensation of employees	10.7	9.5	7.8	7.7	8.0	-2.7
Interest payments	1.5	1.5	1.6	1.7	1.7	0.2
Social assistance	13.2	13.7	13.1	12.1	11.7	-1.5
Subsidies	1.1	1.0	0.9	0.7	0.5	-0.6
Other current expenditure	1.4	1.9	2.0	2.3	1.8	0.4
Gross fixed capital formation	6.0	5.7	5.5	4.8	4.6	-1.5
Budgetary deficit	**-8.9**	**-6.6**	**-5.5**	**-3.0**	**-2.2**	**6.6**

Source: Eurostat

Table 3

The evolution of budgetary expenditures according to the functional classification in Romania in 2009-2013 (% of GDP)

	2009	2010	2011	2012	2013	Differences - 2013 compared to 2009
Total	40.6	39.6	39.2	36.4	35.2	-5.4
General public services	4.3	4.5	4.8	4.9	4.9	0.6
Defense	1.5	1.4	0.8	0.7	0.8	-0.7
Public order and safety	2.1	2.4	2.2	2.2	2.2	0.1
Economic affairs	7.9	7.0	7.1	6.5	6.2	-1.7
Environment protection	0.6	0.8	0.9	0.8	0.7	0.1
Housing and community amenities	1.4	1.3	1.2	1.1	1.2	-0.2
Health	3.8	3.3	4.1	3.8	4.0	0.2
Recreation, culture and religion	1.1	1.0	1.1	1.0	0.9	-0.2
Education	4.1	3.3	4.1	3.0	2.8	-1.3
Social assistance	14.0	14.6	12.8	12.3	11.5	-2.5

Source: Eurostat

It can be observed that most of the fiscal adjustment of 6.6 pp of GDP was achieved by reducing budget expenditures (-5.4% of GDP) while increasing revenues contributed only with 1.2% of GDP. This evolution is in line with the recommendations from the literature which shows that it is preferable to reduce outlays to the detriment of tax hikes. Most of the reduction in expenditure was achieved through compensation of employees (-2.7% of GDP), important contributions also having social assistance (-1.5% of GDP), gross fixed capital formation (-1.5% of GDP), intermediate consumption (-0.7% of GDP)

and subsidies (0.6% of GDP). Beyond the analysis of expenditure according to the economic classification it is relevant to analyze them also according to the functional classification – from this point of view the categories most affected by expenditure cuts were social assistance (-2.5% of GDP), economic activities (-1.7% of GDP), education expenditure (-1.3% of GDP). It should be noted that the decrease in the share to GDP of these budgetary aggregates was not achieved in general by reducing spending in nominal terms, but rather trough the denominator, namely a higher nominal GDP, supported by a relatively high GDP deflator. Thus, it can be concluded that more than 50% of the spending cuts have been achieved through elements not recommended in terms of the hierarchy presented by Cournède et. al (2013) respectively by reducing investment spending and those with education, while the difference up to 100% accounts generally spending reductions placed in the bottom of the hierarchy in terms of distortionary impact (pensions, intermediate consumption). On the revenue side, tax hikes were localized to the level of the budgetary aggregates placed in the middle of the hierarchy. Thus, the quality of the fiscal consolidation process was an average one in terms of minimizing its negative impact on economic growth, equity, in the distribution of income and the current account balance.

5. Conclusions and implications for policymakers

The optimality of the fiscal consolidation program initiated by Romania in 2010 designed to correct the significant fiscal imbalances existing at the end of 2009 can be assessed both from the perspective of the outcomes on improving the public finances position, but also in terms of the costs associated, namely the impact on economic growth, social equity and the current account balance. Undoubtedly, the reduction in the headline budgetary deficit from the level of 8.9% of GDP in 2009 to about 2.2% in 2013 is a success, even in the conditions of an alert fiscal consolidation pace of over 1.6 pp of GDP annually, possibly slightly higher than the optimal one, but conditioned by the Romania's commitments derived from the status of EU membership. Basically, the fiscal consolidation need existing in Romania at the end of 2009 was delivered in full by the end of 2013, the public debt being stabilized at a level below 40% of GDP while the long-term sustainability should be ensured through respecting the medium term budgetary deficit objective of 1% of GDP in structural terms. The convergence to this target from a headline deficit of 2.2% of GDP by the end of 2013 could take place in line with the requirements of the preventive arm of the Stability and Growth Pact,

i.e. at a pace of adjustment of 0.5 pp of GDP annually in structural terms.

Judging by the composition of the fiscal consolidation program, the results are mixed. The quality of fiscal adjustment package was an average one in terms of the associated costs related to economic growth and social equity as certain expense categories, such as investment and education were reduced extensively during this period, which it is not recommended according to the literature regarding fiscal consolidations. It is true that the dimension of the accumulated imbalances imposed measures with significant budgetary impact and to some extent changes in the budgetary aggregates with high distortionary effects were inevitable, but also other elements could have been selected in the process of fiscal consolidation as such property taxes, environmental taxes or additional and extensive measures could have been taken in order to reduce intermediate consumption.

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DETERMINANTS OF SUSTAINABLE BANKS' PROFITABILITY. EVIDENCE FROM EU COUNTRIES[1]

Iustina Alina BOITAN, PhD*

Abstract

The paper aims at assessing whether responsible banking behavior is a precursor and catalyst of banking profitability. Consequently, the paper will investigate the exogenous determinants of the EU sustainable banks' profitability during the period 2006-2013. For the purpose of this study it has been considered the commercial banks resident in EU countries that voluntarily joined the United Nations Environment Program – Financial Initiative. The empirical study will be developed on several stages. First, explanatory variables comprising macroeconomic, institutional and public perception variables will be statistically processed. Secondly, it will be performed correlation analyses and Granger causality tests. Third, it will be employed a panel data regression with fixed effects, to account for those explanatory variables that boost or, on the contrary, compress sustainable banks' profitability.

Keywords: sustainable bank, profitability, macroeconomic fundamentals, sentiment indicator, panel data regression

JEL Classification: C23, G21

1. Introduction

In the post-crisis period evidences on banking activity showed that those that followed a responsible financial behavior were the greatest beneficiaries, in terms of market share increase, rise of deposits collected, increase of the number of customers. To sum up

[1] *An earlier version of the paper was presented at The 2nd International Conference "Economic Scientific Research – Theoretical, Empirical and Practical Approaches" – ESPERA 2014, organized by National Institute for Economic Research "Costin C. Kiritescu", National Bank of Romania and Center for Economic Information and Documentation, November 13-14, 2014, Bucharest, Romania.*

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last years' trends, is seems that responsible banking behavior is a precursor and catalyst of banking profitability. It should be mentioned that the responsibility stream in banking overlaps on another crucial topic at European level, namely the achievement of sustainable regional economic development (Davidescu, Strat 2014).

The Global Alliance for Banking on Values (GABV), 2012 presented evidences on the different financial profiles of sustainable banks, as opposed to global systemically important financial institutions. The study covered the 2007-2010 time periods and comprised 17 sustainable banks and 29 banks classified as Global Systemically Important Financial Institutions by the Financial Stability Board. It concludes in its report that sustainable banking can be more profitable and less risky than mainstream large banks, by surpassing the latter on several financial metrics: greater exposure to customers in both deposits (deposits/total assets of 72.5% compared to only 42% for conventional banks) and loans (loans/total assets of 72.4% versus 40.7% for conventional banks), higher levels of growth recorded by loans (80.52% versus 21.38%) and deposits (87.74% versus 27.28%), a relatively higher and better quality capital (tier 1 capital represents 12.2% for sustainable banks and 10% for conventional ones), better returns on assets (0.44% versus 0.33%) and comparable returns on equity (7.26% versus 6.06%).

One year later GABV, 2013 updated their study and found that, although expanding the time horizon to cover the 2003-2012 years, new results remained consistent with the past research. On over-the-cycle average, sustainable banks lend almost twice as much of their assets on their balance sheet (75.9% compared to 40.1% for the conventional banks, from 2003 to 2012), their main source of funding is customers' deposits (73.1% versus 42.9%) and have stronger capital positions. In terms of financial returns, it seems that sustainable banks have historically stable returns on assets, of around 0.56%, with lower levels of volatility and better returns recorded post-crisis (0.53% compared to 0.37% for conventional banks).

Relying on the GABV's reports, Herman and Bowmer, 2012 launched into debate the issue of too-sustainable-to-fail banks, characterized by a values-based business model, which is more closely connected with the real economy. By means of the social and environmental criteria embedded into the regular decision making

process, they provide quantifiable human impact metrics and green, innovative products.

By voluntarily becoming signatories of the different international sustainability frameworks (UNEP FI, United Nations Global Compact, Equator Principles etc), sustainable banks state that their goal is to decisively and positively contribute to sustainable development, by linking the fulfillment of local community needs with environment protection and sound economic prospects. In achieving this major goal, they try to avoid excessive risk taking and focus on obtaining long-term profitability.

Starting from these realities and trends, the paper intends to bring together two concepts apparently conflicting, namely responsible financial conduct and profitability. Consequently, the paper will empirically investigate whether there is a causal relationship between a set of exogenous variables and the level recorded by banking profitability. Thus, we will be able to answer several questions: What are the specific external drivers of sustainable banks' profitability? Might these exogenous factors influence a conventional bank's decision to commit to a path of sustainable, socially and environmentally responsible financial behavior?

Our paper intends to fill the gap in the existing literature, by focusing on two insufficiently explored issues: a distinctive segment of the banking system, represented by sustainable banks, and European Union coverage. In contrast to existing literature that focuses mainly on individual countries, it will be employed a bank-level panel data analysis, the sample consisting of 28 sustainable banks resident in 13 EU member countries. To explain bank profitability it has been used a set of macroeconomic, institutional and public perception variables.

The structure of the paper is as follows: the first part illustrates the reinforcing relationship between profitability and socially responsible behavior of banks. The second part summarizes the previous empirical research on conventional banks' profitability and its exogenous determinants. The third part depicts the process for variables selection, the sources of data, the statistical tests performed, the methodology and results.

2. Literature review of bank profitability determinants

Most papers devoted to the study of banks' profitability determinants examine with predilection the banking system of a given country, such as Greece (Athanasoglou, Brissimis and Delis 2005; Alexiou and Sofoklis 2009), Switzerland (Dietrich and Wanzenried 2011), Spain (Trujillo-Ponce, 2012), Nigeria (Aburime, 2008), Turkey (Alper and Anbar 2011), China (Sufian and Habibullah 2009), India (Karimzadeh, Akhtar and Karimzadeh 2013), the U.S. banking sector (DeYoung and Rice, 2004; Hirtle and Stiroh, 2007; Tregenna, 2009) etc. while others conduct a cross-country analysis. A recent, small strand of economic literature emphasizes the determinants of Islamic banks' profitability (Sufian, Zulkhibri 2011; Masood, Ashraf, 2012; Muda, Shaharuddin and Embaya, 2013).

Although the time span, methodologies and countries considered wary widely across papers, there are some common empirical findings, in terms of bank-specific or macroeconomic variables that affect banking profitability.

Considering the external, macroeconomic factors, Athanasoglou, Brissimis and Delis, 2005 stated that inflation rate, interest rates and cyclical output affect positively the performance of the Greek banking sector. Other studies performed at country-level proved mixed evidence related to the potential correlation between GDP growth and banking profitability: Davydenko, 2010 and Rachdi, 2013 found a positive and highly significant relationship, Kosmidou, 2008 found a negative relationship while Ben Naceur 2003, Beckmann 2007 found no impact of economic growth on banking profitability.

Dietrich and Wanzenried, 2011 empirically investigated the effects of external factors on Swiss banks profitability and found that the GDP growth rate does not affect their profitability. In contrast, the term structure of interest rates has a positive influence while the effective tax rate has a negative but small effect on bank profitability in Switzerland. Positive relationship between inflation and bank profitability has also been documented by Alexiou and Sofoklis, 2009 and Trujillo-Ponce, 2012. The latter argues that this positive impact on profitability is due to bank management expectations of the rate of inflation, which might be used as rationale for adjusting interest rates accordingly, to increase revenues faster than costs.

Few other empirical studies confirm that there is a link between taxation, as an institutional characteristic of a country, and

banking profitability. Demirguc-Kunt and Huizinga, 1999 found that higher taxation diminishes bank profitability, meanwhile Albertazzi and Gambacorta, 2006 argued that taxation has a significant, although small impact on banking profitability because banks can shift a large fraction of their tax burden onto depositors, borrowers, or purchasers of fee-generating services.

Unlike a broad body of economic literature devoted to the study of profitability's macroeconomic determinants, Schipper 2013 empirically found that variables as GDP growth, taxation and inflation rate have no effect on profitability in the Slovakian and Polish banking systems, in any of the sample periods 1999-2011.

A singular study, comprising several European Union countries (Austria, Belgium, France, Germany, Greece, Italy, Ireland, Luxembourg, Portugal, Spain, the Netherlands and the United Kingdom), was performed by Ommeren, 2009 during the time span 2000-2009. He found that, except the GDP growth rate, the effective tax rate and term structure of interest rates are not significant determinants of banks' profitability. An interesting empirical finding is that a negative real GDP growth rate observable during the crisis period has a larger impact on banking profitability than a positive real GDP growth. To our knowledge, there is a singular study that examines the impact of economic freedom index on the performance of Islamic banks (Sufian, Zulkhibri 2011), the empirical findings showing a positive and significant influence.

3. Variables selection methodology and results

The choice of the exogenous variables to be included in our study has been based on the findings reported by previous studies in the field. We divided our dataset into three types of variables: a) macroeconomic, represented by GDP growth rate, inflation rate, unemployment rate and term structure of interest rates; b) institutional, consisting of the effective tax rate and the economic freedom index; c) public perception variables, comprising the economic sentiment indicator and a misery index called Okun index. The macroeconomic variables have been taken from the European Commission's Eurostat database, the economic freedom variables have been collected from The Heritage Foundation database, while data related to profitability and effective tax rate has been extracted from banks' annual reports.

The annual GDP growth rate depicts the dynamics of economic development both over time and between European economies of different sizes. It is expressed as one year percentage change. The inflation rate is represented in our study by the Harmonised Indices of Consumer Prices (HICPs), released by Eurostat for purposes of international comparisons of consumer price inflation. Unemployment rate was computed as an annual average, in percent. For the term structure of interest rates we employed the central government bond yields on the secondary market, gross of tax, with around 10 years' residual maturity.

The effective tax rate has been defined as the amount of taxes paid by banks divided by before-tax profits. This variable mostly consists of corporate income taxes and it's not homogenous across the EU banking systems, as tax rates vary widely. Our intent is to investigate whether this variable significantly impacts the profitability of the banks or, on the contrary, has negligible influence as banks prove able to shift their tax burden toward their regular customers.

The Index of Economic Freedom, annually computed by The Heritage Foundation, documents the positive relationship between economic freedom and a variety of positive social and economic goals. The ideals of economic freedom are strongly associated with healthier societies, cleaner environments, greater per capita wealth, human development, democracy and poverty elimination. Sustainable, socially responsible banks share the same ideals as those embedded into the index, as they use the financial flows to achieve long-term benefits for society and environment. This was the main reason for including the index among the set of explanatory variables, to get an insight of the relationship that exists between banking profitability and the different components of the index. In the study we have included not only the aggregate value of the index, but also some of its components, such as: fiscal freedom (belonging to the category limited government), business freedom and monetary freedom (belonging to regulatory efficiency) and the financial freedom (belonging to open markets category). As retrieved from the Heritage Foundation's 2014 presentation of the different freedom categories, financial freedom is a measure of banking efficiency as well as a measure of independence from government control and interference in the financial sector. Monetary freedom combines a measure of price stability with an assessment of price controls, while fiscal freedom is a measure of the tax burden imposed by government.

Business freedom is a quantitative measure of the ability to start, operate, and close a business that represents the overall burden of regulation as well as the efficiency of government in the regulatory process.

The Economic Sentiment Indicator (ESI) is an official, composite indicator computed and published regularly by European Commission, based on questionnaire surveys. It is made up of five sectoral confidence indicators (industrial confidence indicator, services confidence indicator, consumer confidence indicator, construction confidence indicator, retail trade confidence indicator), each of them being assigned different weights. The higher its value, the more confident are the EU countries' residents in the current developments and future outlook.

The Okun's misery index is another composite indicator whose focus is the assessment of the level of discomfort or dissatisfaction felt by the population and the private sector in a country. It has been developed in the '70s by the economist Arthur Okun and it is contemporaneously computed in the US, on a monthly basis. Its formula consists in adding the inflation rate and the unemployment rate, both entering with equal weights. The assumption is that a macroeconomic environment, characterized simultaneously by high unemployment and inflation, increases the economic and social costs of a country.

The rationale for including in the dataset the two indices, as proxies for the public perception, was to test whether people's awareness on the contemporary evolutions and prospects of real economy, transposed into the computed levels of the ESI and Misery index, might influence the financial performance of sustainable banks. Put in other words, we intend to investigate if socially responsible banks, with their clearly stated concern on the positive, long term impact that lending and investment activity exert on local communities and environment, might take benefits from the macroeconomic fundamentals' fluctuations, in the form of increasing their customers base, their activity and hence market share and financial performance, due to people's awareness that only a responsible banking behavior might stimulate the inclusive, sustainable economic development.

Regarding the dependent variable, we opted for the use of return on assets (ROA), defined as the share of banks' after tax profit in total assets. According to Flamini, McDonald and Schumacher,

2009, ROA is more suited for being used as proxy for bank profitability, instead of the alternative return on equity (ROE), because it takes into account financial leverage and the risks associated with it. This finding is also supported by Dietrich and Wanzenried, 2011 who argue that ROA is a better and stable measure of profitability and claim that banks with a lower leverage ratio (higher equity) usually report a higher ROA but a lower ROE. Other proponents of ROA as a reliable proxy for the financial performance of a bank are, among others Hassan and Bashir, 2003 who state that ROA reflects management's ability to appropriately employ banks' financial and real investment resources to generate profits. Sufian and Zulkhibri, 2011 observe that ROA level depends not only on the bank's management decisions but also on other uncontrollable factors relating to the economy and government regulations.

We relied on panel or cross-sectional time-series data as we aim at empirically investigating the sustainable banks' financial performance dynamics across time. The panel is balanced, meaning that the dependent and explanatory variables are observed for each of the 28 banks and each of the eight years considered, over the 2006-2013 time span.

We have employed time series with annual frequency, consequently our data set is not affected by the seasonal component. Further, it has been run the Augmented Dickey-Fuller test for the presence of unit root or non-stationary features. All the dependent and explanatory variables are stationary in levels, as the test values were lower than the critical thresholds and the probabilities associated with the test values were smaller than the most restrictive significance level, of 1%. The analysis of descriptive statistics provides an insight into the peculiarities of time series distribution, emphasizing which variables depict a normal distribution.

Table 1

Descriptive statistics

	ROA	GDP growth rate	Unempl. rate	Inflation rate	Interest rates term structure	Effective tax rate	Economic freedom	Economic sentiment indicator	OKUN index
Mean	0.57	0.48	8.35	2.28	4.36	24.9	69.21	97.61	10.63
Maximum	4.24	7.9	27.5	7.9	22.5	98.7	80.4	117.5	27.6
Minimum	0	-7.1	3.1	-0.9	1.4	0	53.4	73.3	4.7
Std. Dev.	0.65	3.16	4.56	1.27	3.056	17.29	6.79	11.62	4.52
Skewness	2.5	-0.6	2.36	0.66	3.65	1.67	-0.36	-0.308	1.83
Kurtosis	11.8	2.86	9.26	5.24	19.87	7.49	2.13	2.18	6.87
Jarque-Bera	952	12.6	574.8	63.58	3157.9	292.9	11.89	9.73	266
Probability	0	0	0	0	0	0	0.0026	0.0077	0
Observations	224	224	224	224	224	224	224	224	224
Cross sections	28	28	28	28	28	28	28	28	28

Standard deviation indicates a pattern of homogeneity of the time series, when it records low values. It is the case of ROA and inflation rate, which are the closest to their mean, followed by interest rates term structure, GDP growth rate, unemployment rate and Okun index. At the opposite are effective tax rate and economic sentiment indicator, with the highest standard deviation values, suggesting that the raw data recorded ample fluctuations across the time period and banks considered. GDP growth rate, economic freedom index and economic sentiment indicator recorded for the kurtosis statistic a value close to 3, signaling a pattern resembling to normal distribution. All the other variables depict values well above this threshold, meaning that the presence of extreme values is higher than in the case of a normal distribution. The most symmetric distributions, as pointed by the close to zero skewness, are those of GDP, inflation, economic freedom index and economic sentiment indicator. According to the probability associated to the Jarque-Bera test, the null hypothesis is rejected, meaning that the variables in the dataset do not follow a genuine normal distribution.

Further, it has been generated the correlations matrix to examine if there is the presence of multicollinearity between the explanatory variables to be used in the panel regressions. Statistical theory states that collinearity becomes a problem when the value of the correlation coefficient is above 0.80. In our dataset, the highest correlation has been recorded between unemployment rate and the Okun index (0.96). Consequently, to handle multicollinearity, we proceeded to estimating the regression models by including each of them at a time.

To complement the raw data analysis, it has been performed Granger causality tests. It should be outlined that the results of this test reflect historical correlations and not necessarily economic causation (Flamini, McDonald and Schumacher 2009). For the particular case of employing panel data, the economic theory proposes several approaches for causality testing: to treat the panel data as one large stacked set of data and perform the Granger test in the standard way, provided not to allow data from one cross-section enter the lagged values of the next cross-section or running regressions with pairs of variables to see how each variable affects changes in the other one, by introducing current and lagged values (Bellalah, Levyne and Masood 2013). We decided to apply a different, case-by-case approach, in which the Granger causality test has been

performed distinctly, for each bank in the sample. Thus, one could be better accounting for the macroeconomic, institutional and public perception particularities of each country of origin and their relationship with ROA (see table 2 for results).

Table 2

Results of the Granger causality test

Bank and country of residence	**Granger test results Probability**
ABN Amro, Netherlands	ROA causes GDP growth rate 0.0004
Barclays, United Kingdom	ROA causes interest rates term structure 0.01489
Bayern, Germany	ROA causes investment and fiscal freedom 0.055
BBVA, Spain	ROA causes investment freedom 0.03541
BCR, Romania	Investment freedom causes ROA 0.02913 Economic freedom causes ROA 0.00066
Deutsche Bank, Germany	ROA causes ESI 0.05253
BNP Paribas, France	ROA causes fiscal freedom 0.05173
Danske Bank, Denmark	ROA causes economic and monetary freedom 0.02163 and 0.015 Inflation rate causes ROA 0.051
EFG Eurobank, Greece	ROA causes business freedom 0.00617 Investment freedom causes ROA 0.00011
HSBC, United Kingdom	Economic freedom causes ROA 0.00901 ROA causes financial freedom 0.0000005 OKUN index causes ROA 0.01134 ROA causes effective tax rate 0.00838
HSH, Germany	Financial freedom causes ROA 0.00

ING Bank, Netherlands	Business and financial freedom causes ROA 0.01128 and 0.0122
Intesa Sanpaolo, Italy	Financial freedom causes ROA 0.01962 Monetary freedom causes ROA 0.04227
KfW, Germany	ROA causes GDP growth rate 0.0104
LBBW, Germany	ROA causes financial freedom 0.0000005 ROA causes OKUN index 0.02796
Nordea, Sweden	ROA causes economic freedom 0.03543 Fiscal freedom causes ROA 0.02722 Inflation causes ROA 0.00181
Piraeus Bank, Greece	ROA causes business freedom and OKUN index 0.0268 and 0.025
Rabobank, Netherlands	Business freedom causes ROA 0.01074
Raiffeisen, Austria	Monetary freedom causes ROA 0.00773
Royal Bank of Scotland, United Kingdom	ROA causes unemployment rate 0.00095
Societe Generale, France	Inflation rate causes ROA 0.04023
Standard Chartered, United Kingdom	ROA causes monetary freedom and OKUN index 0.0337 and 0.03773
Swedbank , Sweden	ROA causes monetary freedom 0.04705
Triodos, Netherlands	ESI causes ROA 0.0532

A common concern of researchers is how to model raw data, in order to obtain accurate and reliable statistical inferences. One problem that could arise after testing for unit root, seasonality and multicollinearity is endogeneity. It has been broadly defined as the correlation between the explanatory variables and the error term in a regression which gives rise to biased and inconsistent parameter estimates (Roberts, Whited 2012). Two of the sources of endogeneity are present in our study, namely the measurement error and the

omitted variables. The purpose of the study is to investigate the exogenous determinants of banks' profitability; thus bank specific-variables have not being included in the analysis. Regarding the measurement error, it arises when one uses proxies for measuring unobservable or difficult to quantify variables, such as relying on indexes, which is the case of this study.

Economic literature developed several econometric techniques to address the endogeneity problem, the most suited for our type of analysis being the panel data regression with fixed effects. Compared to classic regression analyses, panel data regression comprises both a spatial and a temporal dimension. The spatial dimension is represented by the observations assigned to the sustainable banks in the sample, while the temporal dimension consists of several time periods. By means of fixed effects one could explain variation within individual banks in the sample.

Our baseline panel regression model is as follows:

$ROA_{it} = \sum \beta M_{it} + \sum \gamma I_{it} + \sum \sigma P_{it} + \mu_i + \varepsilon_{it}$

where

$i = 1,2,\ldots N$ represents the number of sustainable banks in the sample

$t = 1,2,\ldots T$ is the time period

ROA_{it} = the dependent variable, depicting the profitability of bank i at time t

M_{it} = a vector of country-specific macroeconomic variables

I_{it} = vector of institutional variables

P_{it}= vector of public perception variables

μ_i = the banks' fixed effect

ε_{it} = the error term

To check the robustness of the results, we decided to perform our panel regressions by applying two methods: the pooled least squares method, which gives equal weight to all explanatory variables, and the Generalized Least Squares (GLS) which uses cross-section weights, represented by the estimated cross-section residual variances.

Table 3

Results of the panel data regressions

Method: Pooled Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Probability
GDP growth rate	0.071746	0.015451	4.643391	0
Inflation rate	-0.11289	0.040429	-2.79219	0.0058
Interest rates term structure	-0.02644	0.019379	-1.36416	0.1742
Effective tax rate	0.001807	0.002222	0.813508	0.417
Economic freedom	-0.05885	0.030465	-1.93184	0.0549
Fiscal freedom	0.011853	0.019006	0.623661	0.5336
Business freedom	0.005471	0.015917	0.343735	0.7314
Monetary freedom	0.024643	0.0134	1.839021	0.0675
Financial freedom	-0.00709	0.008066	-0.87951	0.3803
ESI	-0.00232	0.004072	-0.56927	0.5699
OKUN index	0.003953	0.016641	0.23757	0.8125
Method: GLS (Cross Section Weights)				
Variable	Coefficient	Std. Error	t-Statistic	Probability
GDP growth rate	0.040192	0.007046	5.704362	0
Inflation rate	-0.04485	0.021167	-2.11887	0.0354
Interest rates term structure	-0.01561	0.012041	-1.29646	0.1964
Effective tax rate	-0.00163	0.001111	-1.46766	0.1439
Economic freedom	-0.03881	0.013151	-2.95115	0.0036
Fiscal freedom	0.010473	0.008335	1.256514	0.2105
Business freedom	-0.00505	0.00748	-0.67534	0.5003
Monetary freedom	0.021733	0.005451	3.986874	0.0001
Financial freedom	-0.00259	0.003309	-0.78199	0.4352
ESI	0.000714	0.001793	0.397975	0.6911
OKUN index	-0.02595	0.007533	-3.44436	0.0007

By comparing the estimates of the two methods it could be noticed that the coefficients of GDP growth rate, inflation rate, economic freedom index and monetary freedom are always

statistically significant, whereas the Okun index is significant only when applying the weighting method. The two types of regressions have been run again, by replacing the Okun index with the unemployment rate, as the two explanatory variables proved to be highly correlated. The results remained unchanged, the only difference being that unemployment rate is significant in the weighting method. Also, it has been estimated the fixed effect, as an individual constant for each bank in the sample. The biggest its value, the more pronounced the tendency for improvement in bank's profitability across the time span considered (Codirlasu, 2010). In all model specifications the highest values of the fixed effect have been recorded by ABN Amro (Netherlands), followed by Standard Chartered and HSBC (both in UK), while the lowest were recorded by Societe Generale (France), LBBW and HSH (both in Germany). To sum up, according the regressions' output the dynamics of the dependent variable ROA is determined mainly by macroeconomic variables (GDP growth and inflation rate) and by an institutional variable (economic freedom index and one of its components, the monetary freedom index). Our results are in line with previous empirical findings of economic literature devoted to this field of research.

4. Conclusions

By relying on a balanced bank level panel data, comprising 28 socially responsible banks in 13 EU countries, we aimed at investigating which are their specific exogenous determinants that significantly affect profitability.

It was found that public perception variables do not have a concluding influence on sustainable banks profitability, at least in the short term. The Okun index is highly statistical significant only when applying weights to explanatory variables and has a negative relationship with ROA. The negative sign of the index is consistent with the economic intuition that low levels of economic discomfort, in terms of unemployment and inflation, enhance banking activity and financial performance. However, it seems that socially responsible banks' profitability is still mainly driven by traditional macroeconomic determinants.

Our findings show that GDP growth rate has a positive and high influence on ROA, whereas inflation rate and the economic freedom index affect it negatively. Interestingly, a high level of the

economic freedom index is not necessarily a precursor of sustainable banks' profitability. This result may be due to the fact that the time period considered comprises the entire pre, during and post crisis period, without differentiating between normal and financial turmoil times. Monetary freedom exerts a positive impact on profitability, meaning that price stability, which is synonymous with low inflation rate, provides a predictable, stable environment for businesses development and contributes to improving profitability. All the other economic freedom components, as well as taxation and term structure of interest rates do not significantly affect banks profitability.

In order to check for the robustness and stability of the results, we removed from the set of independent variables all the components of the economic freedom index and repeated the fixed effect panel regressions. The new estimates showed that the previous results remained mostly the same: the coefficients' sign and level is similar and significant as in the baseline regression specifications.

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TESTING FOR BUBBLES IN THE HOUSING MARKET: FURTHER EVIDENCE FROM TURKEY

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Abstract

In this study whether bubbles exist in the three biggest cities housing market, İstanbul (TR10), İzmir (TR31) and Ankara (TR51) which are important parts of Turkish housing market is investigated. Besides, SADF and GSADF unit root tests developed by Phillips et. al. (2011, 2012) is used in order to detect bubbles in the housing market in the period between January-2010 and June-2014. The results show that real estate bubbles do not exist in the Turkish housing market and price increases above the average are experienced only for the short terms, not over the long terms permanently. In this context, efficient market hypothesis is valid for Turkish housing market and it verifies that Turkish housing market experienced the 2008 Mortgage crisis rather slightly than many other countries. These findings indicate stability in the housing market by sustaining its correct house pricing policy after the crisis.

Keywords: Real Estate Bubbles, Housing Market, SADF, GSADF, Turkey

JEL Classification: C22, R31

1. Introduction

One of the most primary studies about the definition and determination of bubbles in the housing market belongs to Case and Shiller (2004). In this study, Case and Shiller based the reason of price increases in the housing market on the expectations of individuals who want to buy house. The rise in the demand of people who expect increase in the house prices for current housing market causes price increase in the housing market. Buying a house instead of saving becomes an appealing choice due to the expectations of

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price increase in the future period. Furthermore, the ones who wish to buy a house create an impulsive force as they have the fear that they cannot afford to buy a house in the future if they do not buy it now. The anticipation that house prices will not decline for long term makes housing purchasing more appealing as an investment. Moreover, Shiller (2007) states that many different thoughts and emotions lie behind the people's decision whether to buy a house or not, in his another study. People's fear which is caused by an incident resulting from terror or war, or changes in the macroeconomic demonstrations of the states have an impact on house demands and correspondingly on the house prices.

Along with all these, increasing of house prices cannot continue increasingly to forever and this is economically impossible. Hence, the bubbles in the housing market emerge at this point. As expectations of price increase in the housing market change inversely, the demand for house will decline and as a result of this house prices also decrease too, which pave the way for bubbles in the house pricing.

Besides, decreases of the interest rates and increases in the level of income in a state also play a role in price rises in the housing market. But according to study of Case and Shiller (2004), if the price increases in the housing market can be explained through basic indicators such as increase in the levels of income and demographic data, the price increases in such sector do not show the existence of bubbles.

When the Mortgage crisis, the biggest economic crisis of recent years, and its effects are taken into consideration; speculative bubbles in the housing market are one of the potential reasons of economic crisis both locally and globally (Oliveira et. al., 2014). The basic factor which lies behind the all financial crisis is disappearance of financial bubbles in asset markets, which triggers the crisis.

As it is remembered, the primary focus of the 2008 crisis was speculative bubbles in American housing market. The most essential reason of bubbles created by careless and inflated housing credits can be explained through the interest rate which has declined nearly to 1% since 2001 and subprime credits due to the increase of excess funds in the market (Eraslan and Bayraktar, 2012).

In his assertion in July, 2014; eminent economist Prof. Dr. Nouriel Roubini who is the leader of Turkish branch of IMF, which is known as augur of crisis, warned people that there may be bubbles in housing market in 18 countries including Turkey. According to

Roubini, along with the fact that this situation derives from many reasons in developing countries but especially countries like Turkey the main reason is inflation and generally in countries such as Turkey, India, Indonesia and Brazil that struggle with high inflation rates, people have limited financial instruments for investment purposes and to increase their financial assets without being affected by inflation, as a result owning a house is seen as a safe harbor and they prefer to buy houses to protect against the cost of high inflation during the recession periods. (Roubini, 2014). It is sensible to associate increase in house prices with the increasing demand, instead of searching the reasons in factors which are based on supply (Erol, 2013). Low interest rates of banks is also another cause of this demand. Furthermore, persistence related to political stability in these rates lead investors to buy houses. Another factor which causes financial bubbles in housing can be ranked as extension of credit volumes in banking system (Kargı, 2013).

In this context, it is essential to detect explosive attitudes in house price (Pavlidis et. al., 2013). When the studies carried out in literature are examined, it is seen that such tests like unit root, cointegration and causality are used. Moreover, Rolling ADF (RADF), Sup ADF (SADF) and Generalized Sup ADF (GSADF) tests developed by Phillips et. al. (2011, 2012) in recent years are used commonly for this purpose. On the other hand, these tests are not only used for detection of bubbles in housing market but also used for determination the bubbles in stock market. The studies carried out through these new unit root tests used to determination of bubbles in housing sector are presented in literature review part of paper.

2. Literature Review

Chen and Funke (2013) used recursive unit root test and they tried to examine the existence of bubbles in German housing market. In this study, any finding indicates the existence of speculative house price bubbles were not found between the 1987Q3 – 2012Q4 periods. However, in another study, they (2013) detected the bubbles in the Chinese housing market.

Pavlidis et. al. (2013) analyzed real estate bubbles related to the housing prices of 22 countries by using SADF and GSADF tests. As a result of the study, in most of the countries in which there is the housing bubble and it was observed that synchronized explosive behavior occurs.

Gonzalez et. al. (2013) state that there are housing bubbles in Colombian housing market by using the SADF test, besides applying CPI and the housing rent index as a deflator in their studies.

Yiu et. al. (2013) investigated housing market in Hong Kong and they found that there are many positive bubbles which are existed in 1995, 1997, 2004 and 2008; and negative bubbles emerged in 2000 and 2001.

In addition to these, Engsted et. al. (2014) analyzed 18 different countries, as a result of that they reached the presence of real estate bubbles and their findings are supported with co-explosive VAR test.

In another study, Oliveira et. al. (2014) went into Brasilian housing market with using monthly data between 2008 and 2013 periods and by recursive SADF and GSADF tests. The outcomes proved the being of bubbles in two biggest cities of Brasil (Rio de Janeiro and Sao Paolo).

Chang and Gupta (2014) analyzed the being of bubbles in BRICS countries by using both SADF and GSADF tests. According to SADF test results, bubbles existed in only Brasil and South Africa, although outcomes of GSADF test show that bubbles in housing obtained in all BRICS countries.

Gallager et. al. (2015) examined the existence of real estate bubbles in Republic of Ireland and Northern Ireland and exposed the entity of bubbles in both two countries. In the light of the results, it is predicted that there can be possible spillover effect between these two countries.

As it can be seen, the number of studies carried out with new technics such as RADF, SADF and GSADF is quite little in housing market. Along with this, any study which examines the housing market in Turkey with these new techniques has not been done yet. The fact that it is the first study which uses these new technics in order to examine Turkish housing market puts forward the original side of this article.

3. Data and Methodology

The study which examines the existence of bubbles in housing market in İstanbul, İzmir and Ankara, the three biggest cities of Turkey, covered the monthly data from the period between January-2010 and June-2014. House price index data which were obtained from the database of Turkish Republic Central Bank contained a period consisting of 54 periods.

Determination of presence and location of speculative bubbles is a challenging process which carried out through historical data. Recent studies about this topic are based on standard present value formulation, which is used by Shiller (2000), Mikhed and Zemcik (2009) in order to detect the relation between the cash flow arising from welfare and house prices.

Testing the stationarity of price/rent rate is a way to define the existence of bubbles. As a result of this, the researchers of this field seek for new ways to find whether this rate is stationary or not. In this context, unit root tests which is used by using autoregressive models are commonly used to detect stationarity of series. Conventional left-sided Dickey Fuller test, which is used for accomplish to this aim, makes autoregressive AR predictions in first level.

According to this model, if the rest in the first order autoregressive model is still related with each other, the test can be extended for higher level autoregressive process with ΔPt-1.

In contrast, SADF test which is proposed by Phillips et. al. is a right sided test. When it is assessed in the context of DF test, the test is based on the regression below:

$$\Delta p_t = \alpha + (\beta - 1) p_{t-1} + \epsilon_t + \epsilon_t \sim iid\left(0, \sigma^2\right)$$

While the hypothesis represents unit root, the alternative hypothesis H1 represents explosive behavior. Hı=β>1 (right sided).

SADF test carries out a hypothesis which is based on the subvalue of ADF statistic serial, by anticipating ADF model repetitively on a forward expanding sample series.

Window size (rw) expands from r0 to 1. Here, while r0 is the smallest sample window; 1 is the biggest sample window, in other words it is the total sample size. r1, which is the start point of sample series, is fixed to “0”. Hence; r2 which is the final point of each sample is equal to rw. r1 changes from r0 to 1. The ADF statistic of a sample which goes 0 from r2 is shown as $ADF_0^{r_2}$.

Phillips et. al. (2011, 2012) applies right tailed ADF test on a forward expanding sample repetitively and makes conclusions according to critical value of corresponding ADF statistic sequence. Thus, Phillips et. al. shows that it enhances its power dramatically when compared to conventional cointegration test of SADF. This test also provides a dating strategy about defining the start and the end points of bubbles.

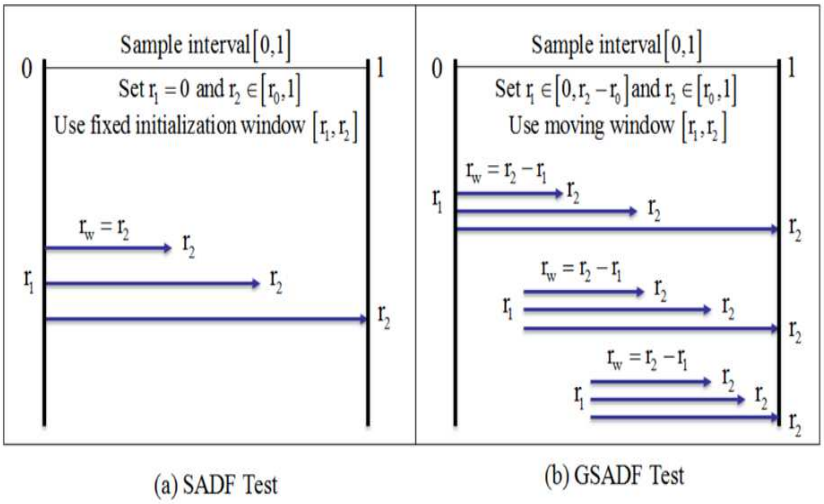
SADF test can be unsuccessful and incoherent at revealing the existence of bubbles in long term time series and analyzing the

fast changing market data. Generalized Sub ADF (GSADF) test, which is a new approach by Phillips et. al., is put forward to reduce these weak points of SADF test.

GSADF test is based on a right-tailed ADF test which is applied repetitively like SADF test. But, the sample sequence of GSADF test extends to more extensive and flexible range. Namely, on the first observation of the sample extends; GSADF test extends the beginning and the end points of the samples over a feasible range of flexible windows.

It is designed to catch explosive behavior seen in sample sequences of SADF and GSADF tests&overall sample, and provide the adequate observation which is required for starting the self-renewal. For this reason; GSADF covers more subsamples of test data and has much more window flexibility. So, it is a more effective method for revealing the explosive behaviors in multiple episodes. The main idea of GSADF test is based on applying the ADF test regression to a sample sequence repetitively just like SADF test. However, the sample sequence of GSADF test is more extensive than of the SDAF test. Along with changing the final point of regression r2 from r0 to 1; GSADF test also makes it possible for the beginning points of test (r1) to change from 0 to r2-r0 in a feasible range. Figure 1 shows the sample intervals of SADF and GSADF tests.

Figure 1: Intervals of SADF and GSADF Unit Root Test



(a) SADF Test (b) GSADF Test

According to Phillips et. al. GSADF is defined as;

$$GSADF(r_0) = \sup_{\substack{r_2 \in [r_0, 1] \\ r_1 \in [0, r_2 - r_0]}} \left\{ ADF_{r_1}^{r_2} \right\}$$

Similar to SADF statistic, the smallest windows size in asymptotic GSADF distribution depends on r_0. The decision should be made according to "T1" which is the total observation number of r_0 in practice. If "T" is low, the value of r_0 should be chosen appropriately enough to provide a right initial estimation and adequate observation. If "T" is high, r_0 can be set as a small number in order not to miss an early explosive episode.

GSADF test is a rolling window right sided ADF unit root test with double-sup window selection criteria. Different from Phillips et. al.'s SADF tests, windows size is chosen by using the double-sap criteria and ADF test is applied to sample sequences, which have the moving windows frame feature, gradually until the last sample. SADF test is incapable of detecting the location of bubbles in such cases like there is a collapse in sample range and multiple episodes of exurbance. GSADF test is successful at detecting the location of bubbles and it also provide advantages in long historical data series.

4. Empirical Findings

In this study, SADF and GSADF tests developed by Phillips et. al. (2011, 2012) were used to determine real estate bubbles in Turkish housing market. Monte Carlo simulation was carried out with 10000 iteration while test statistics were being acquired during analysis. The initial window size was set as 0.10. Additionally, the result of analysis were obtained through trend and intercept models due to the structure having trend of prices.

According to results of the study, bubbles came onto being only in Ankara. The fact that SADF test statistic related to house prices in Ankara was higher than critical values verifies this outcome. However, according to GSADF test it was not possible to mention the existence of bubbles in these 3 cities because the test statistics for each three cities are below the critical values. These results show that Turkey has been more cautious approach about house pricing since the 2008 Mortgage crisis, and prices above average have not emerged for long term in this market. This proves that efficient market

hypothesis is valid in Turkish housing market. These results are shown in Table 1.

Table 1

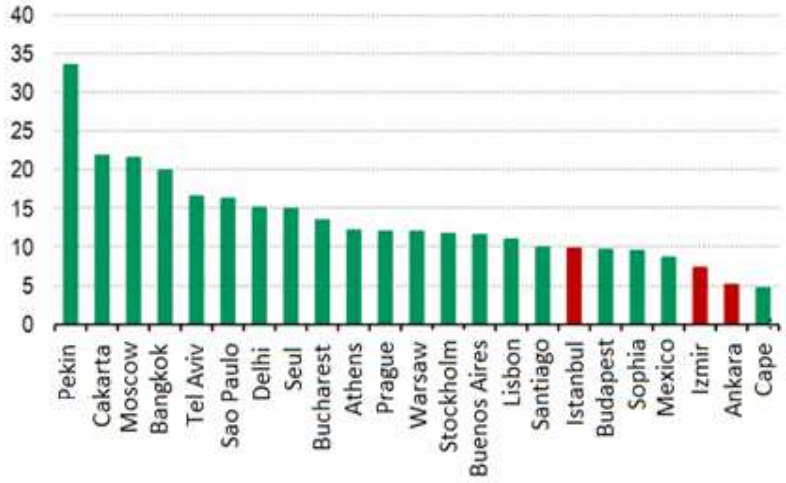
Results of SADF and GSADF Test for Housing Price Index (n=0.10)

	Test Statistic		
Cities	**SADF**	**GSADF**	
İstanbul	-0.25	2.81	
İzmir	-0.31	1.70	
Ankara	0.62*	1.53	
	Critical Values		
	% 1	**% 5**	**% 10**
SADF	3.83	1.04	0.59
GSADF	9.95	4.31	2.96

On the other hand, figure 2 shows the income/price rate of housing market in the big cities of developing countries in May, 2014.

The columns standing for income show the rent income the house owners get. It can be concluded from the relatively low price/income rate compared to other big cities that bubbles do not exist in the Turkish housing market.

Figure 2: Price / Income Ratio Comparison in Developing Countries



Reference: Karakaya, Kerim, (2014)

The detailed version of findings in table 1 is shown in Figure 3 and 4 (in the Annex) about results of SADF and GSADF unit root test. No matter how much does the general test statistics show that bubbles do not exist in these three cities, price increases above the average can be seen from time to time. However, these increases do not cause real estate bubbles as they disappear in a short time. The similar progress of market in İstanbul and İzmir stands out when these graphics are examined in depth. According to GSADF test results; both in the housing market in İzmir and İstanbul there is a price increase for short term in the second half of 2011 and the beginning of 2013 but this increase disappears soon after. The house prices in Ankara have slightly different structure when compared to those two cities. On the other hand, according to SADF tests, each of these three cities has different tendencies. Although the test statistic related to Ankara is seen significant at 10%, it is not that high value for a test statistic. Thus, the tendencies that bubbles do not exist in Ankara is at underestimated level. The results of GSADF test, which is more developed compared to SADF, verify these finding.

5. Concluding Remarks

In general; such factors like people's expectations about the future and purchasing preferences shaped by these expectations, low interest rate and simplified credit requirements cause the increase in demand for houses. The change in people's anticipation for house prices or reversal of interest and credit applications brings about the financial term "bubble" which results from the reversal of the price increase observed in housing market. For example, as a result of Turkish Republic Central Bank's decision of reducing the interest rates in July 17, 2014; the question whether the quick demand in housing market and price increases are bubble or a revival in the market has become a current issue.

In this study; the accuracy of the facts that quick increase of prices cannot be an indicator of bubbles and the house pricing is appropriate for efficient market hypothesis are verified with SADF and GSADF unit root tests developed by Phillips et. al. (2011, 2012). The data from housing market in Turkey's three biggest cities İstanbul, İzmir and Ankara are used in this study. Monte Carlo simulation is carried out with 10000 iteration while test statistics are being acquired during analysis. According to results of the SADF unit root test, bubbles exist only in Ankara. Additionally, according to GSADF test it is not possible to mention the existence of bubbles in these 3 cities.

The results of this study, which is the first research testing the housing market bubbles with SADF and GSADF tests, are compatible with the Turkey's outcomes of the house price/house income which are seen as basic indicators for explaining the price increases in housing market by Case and Shiller (2004). They also advises to examine real price changes in the market to gain a wholistic perspective. The real price changes in last four years in Turkey (March 2010-March 2014), adjusted for inflation, show that house prices have increased by 14.2%. This increase rate is not an indicator of an abnormal increase and supports the result of the study by showing that bubbles in housing market do not exist in Turkey. If the house prices keep increasing at the same rate for 7-8 years in a long run, there may be a risk of bubbles in housing market in Turkey.

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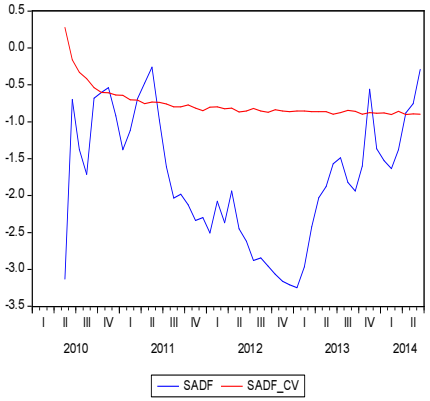
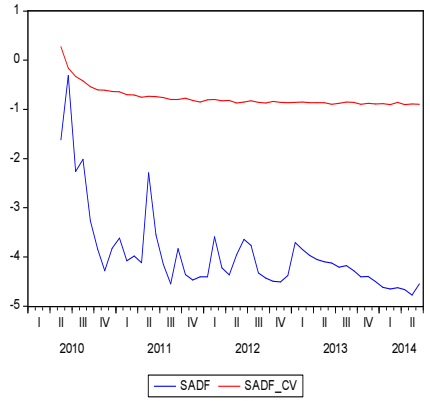
Annex

Figure 3: Graphs of Test Results for Housing Markets in Turkey (SADF)

İstanbul



İzmir



Ankara

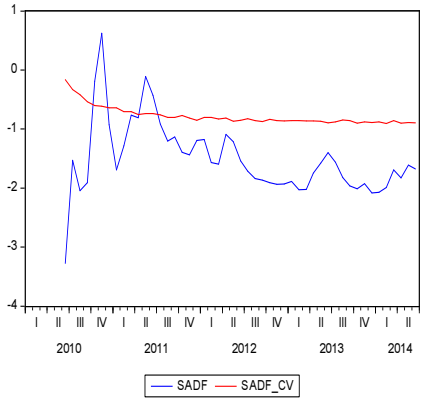
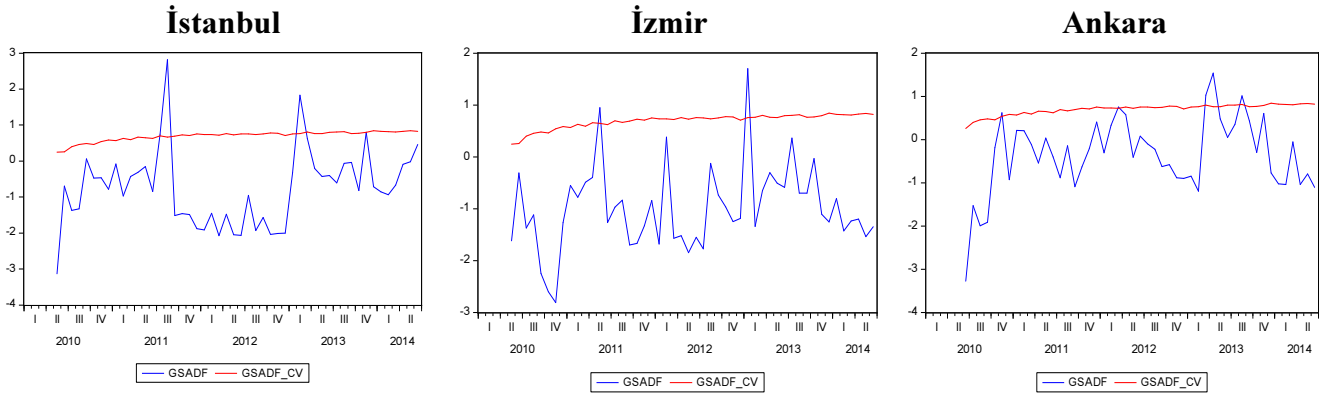


Figure 4: Graphs of Test Results for Housing Markets in Turkey (GSADF)



CONNECTION OF EUROPEAN ECONOMIC GROWTH WITH THE DYNAMICS OF VOLATILITY OF STOCK MARKET RETURNS

Adrian Cantemir CĂLIN, PhD*

Abstract

The connections of macroeconomic growth and the financial markets are vastly studied in Europe mostly from the banking perspective. The impact of the capital markets on the economic development and the increased integration of all financial markets constitute an important element in the study of macroeconomic growth. The objective of this paper is to provide an analysis of the possible connections of the volatilities of stock market indexes computed with a GARCH model and the macroeconomic growth for a series of ten European countries. The problem of different frequencies – daily for the stock indexes and quarterly for the GDP growth – is solved by the use of the MIDAS methodology. We found connections of the dynamics of volatilities and main global events as well as the dependence of growth on these volatilities for some periods and some European countries.

Keywords: volatility, stock markets, MIDAS methodology

JEL Classification: G15, G17

1. Introduction

The macroeconomic growth and the financial development are largely interconnected and usually the links are two-way. The impact of the capital markets on the economic development and the increased integration of all financial markets constitute an important element in the study of macroeconomic growth, this subject being in the attention of researchers, practitioners, investors, and policymakers either. This subject is important for research by possible revealing of some macroeconomic determinants of systematic risks of the financial sector.

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In asset pricing theories, macroeconomic indicators have an important role, determining many authors to empirically study the relation between macroeconomic variables and stock market volatility in different periods, with different frequencies, and for various regions.

While there are studies that highlighted the attention on international financial contagion, most papers (e.g. Levine 1997 and 2005; Wachtel, 2001) dealing with the relation economic growth – financial development are sustaining that financial depth is entrench economic growth by trade channel, by identifying proper investment opportunities, increasing liquidity, by promoting good corporate governance, and increasing diversification possibilities.

It was documented that there is no European economic growth pattern, as the recession induced by the recent global financial crisis was widespread with noticeable differences across countries, and also the economic recovery has taken place with different steps (Criste et al., 2011). The problems regarding the euro area governance were debated and marked out by Criste and Lupu(2012) that also highlighted the social and political implications of the crisis on European countries (Criste and Lupu, 2013).

Despite the efforts for economic convergence in the European Union, the financial architecture of its members is still diverse, the differences increasing more after the enlargement of 2004 and 2007. The unique feature of European financial system are observable in time and across the two main components (main group and new members) while comparing with other important financial markets in the world.

The stock market behavior is fluctuant and instable, while is connected with the relevant macroeconomic indicators (King et al, 1994; Corradi et al, 2010), international economic trends, political decisions (Siokis and Kapopoulos, 2007), consumption behavior (Campbell and Cochrane, 1999), and population demographic trend (Ciumara and Lupu, 2014).

The objective of this article is to provide an analysis of the possible connections of the volatilities of stock market indexes computed with a GARCH model and the macroeconomic growth for a series of ten European countries. The problem of different frequencies – daily for the stock indexes and quarterly for the GDP growth – is solved by the use of the MIDAS methodology.

The paper is structured in the following sections. Section 2 provides a short description of similar economic literature. Section 3

presents the data and the methodology used for the study, section 4 explains the obtained results while the last section round off the main conclusions.

2. Literature Review

As was previously shown in Albu (2014), the financial sector is compulsory for economic growth as was evidenced by many economists, but the financial crisis arisen in 2007 demonstrated that it can have a negative impact on the economy also.

The strong business cycle of stock market volatility, lower in expansion periods than in recessions, was evidenced by the papers of Errunza and Hogan (1998), Schwert (1989), , and Hamilton and Lin (1996), Brandt and Kang (2004), although it may depend on unobservable factor (Heston, 1993).

However, the distribution of price volatility during turbulent periods is still unknown and probably depend on the type of financial markets development, the distributions of jumps during financial crises being rather dependent on method used (Hanouseka et al, 2014).

The economic forces that influence the reaction of stock markets was previously documented by Chen et al (1986) that investigated if innovations in macroeconomic indicators (systematic economic news) affect the stock market returns, the authors concluding that these news are rewarded in correspondence with their exposure.

Karunanayake et al (2012) overlooked the interaction between GDP growth rates and stock market returns in US, UK, Canada, and Australia for a long period (1959-2010) using a multivariate GARCH model in order to introspect the cross-country transmission across analyzed countries. The results are demonstrating a country specific transmission from GDP growth to stock market only in US, while the spillovers from stock markets to GDP growth are transmitted in US and Australia and an influence from US to all the others.

Using a bivariate VAR-GARCH(1,1), Caporale and Spagnolo (2011) analyzed the relations between economic growth and stock market in Czech Republic, Hungary and Poland, their results pointing out a one way causal relation from stock market to the economic growth, this relation being more solid after the accession into EU of these countries. For a larger sample of East European countries (11 EU new members, in the period 2000-2013) Albu et al (2014)

explored the long term correlation between stock market capitalization and GDP per inhabitant; after using a nonlinear model, the results disclosed that the dynamics was bigger in countries with a GDP per inhabitant under the average GDP in all 11 countries.For a set of seven East European Countries, Lupu and Calin (2014) investigated the possible bonding between economic growth and stock market dynamic in the period 1998-2014, concluding that there is slight dependence between analyzed indicators, Slovenia been the only exemption.

3. Data and Methodology

Our data for the dynamics of the European capital market consists of daily data for the stock market indexes from January 2000 until October 2014 for a set of European countries: Austria, Belgium, Czech Republic, France, Germany, Hungary, Italy, Netherlands and Portugal, totaling 4773 observations for each series, in a synchronous framework. Table 1 below shows the descriptive statistics of these series for the whole interval. We can notice that the main statistical properties identified by the literature hold for this sample. The second part of Table 1 exhibits the first four principal moments for the quarterly growth of the same countries for the same time frame.

Table 1

Statistical properties of logarithmic changes in stock prices and GDP per capita

	Stock Indexes				GDP per capita			
	Mean	**St. Devs**	**Skewness**	**Kurtosis**	**Mean**	**St. Devs**	**Skewness**	**Kurtosis**
AUSTRIA	0.00	0.01	-0.38	14.53	0.01	0.05	-0.92	2.48
BELGIUM	0.00	0.01	0.06	12.78	0.01	0.06	0.07	1.42
CZECH REP.	0.00	0.01	-0.96	25.35	0.02	0.08	-0.80	3.07
DENMARK	0.00	0.01	-0.24	10.39	0.01	0.04	-0.23	2.03
FRANCE	0.00	0.01	-0.11	9.99	0.01	0.03	0.44	1.97
GERMANY	0.00	0.01	-0.14	10.27	0.01	0.02	-0.53	2.90
HUNGARY	0.00	0.01	0.20	18.83	0.01	0.10	-1.00	3.16
ITALY	0.00	0.01	-0.25	9.96	0.00	0.08	-0.17	1.68
NETHERLANDS	0.00	0.01	-0.13	12.78	0.01	0.04	0.27	1.67
PORTUGAL	0.00	0.01	-0.40	13.57	0.01	0.05	-0.23	1.99

Source: Datastream, author's calculations

We notice that the stock indexes exhibit the well-known stylized facts for the daily log-returns, as mentioned in state-of-the-art articles, with zero mean, low volatilities and mostly negative unconditional skewness and large unconditional kurtosis. We also can observe the same unconditional moments for the GDP per capita series.

As far as the methodology is concerned, we are using two main tools, a volatility model and the mixed frequency model. According to the development of Bollerslev (1986), the seminal GARCH model extends the work of Engle (1982) to allow for the employment of past conditional volatilities in the detection of the current volatilities. We reproduce here the shape of this model:

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{m} \alpha_i a_{t-i}^2 + \sum_{j=1}^{s} \beta_j \sigma_{t-j}^2$$

where:

$$\alpha_0 > 0, \alpha_i \geq 0, \beta_j \geq 0$$

The connection between the daily log-returns for the stock market indexes and the quarterly changes of the GDP per capita is realized by means of the ADL-MIDAS (p_Y^Q, q_X^D) model in keeping with the developments of Andreou, Ghysels, and Kourtellos (2010). Their work consists in the generalization of an aggregation algorithm for the high frequency data according to the following specification:

$$Y_{T+1}^Q = \mu + \sum_{j=0}^{p_Y^Q - 1} \alpha_{j+1} Y_{t-j}^Q + \beta \sum_{j=0}^{q_X^D - 1} \sum_{i=0}^{N_D - 1} w_{i+j*N_D}(\theta^D) X_{N_D - i, t-j} + u_{t+1}$$

The weighting structure is denoted by $w(\theta^D)$ and the mentioned paper is using the Almon lag polynomial

$$w_j(\theta^D) = w_j(\theta_1, \theta_2) = \frac{exp\theta_1 j + \theta_2 j^2)}{\sum_{j=1}^{m} exp(\theta_1 j + \theta_2 j^2)}$$

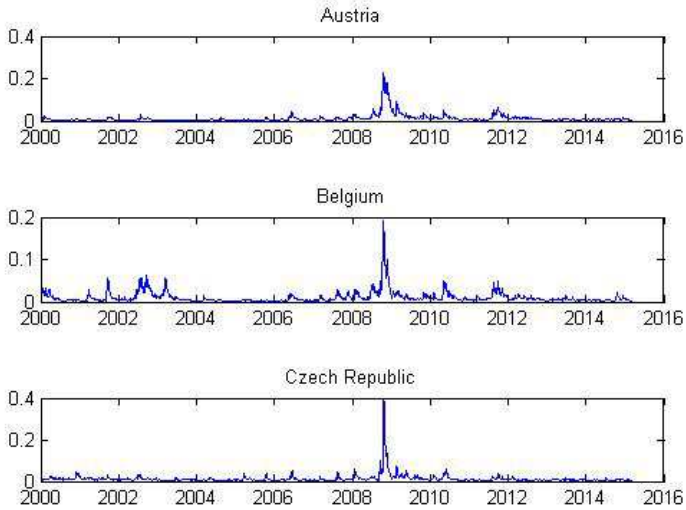
Under these notations, our quarterly changes in the GDP per capita is represented by Y_t^Q and the log-returns of the indexes used as explanatory variables are denoted by X_t^D.

4. Results

This section provides the results obtained as consequence of performing the above mentioned methodology for the data described previously.

The first three charts are exhibiting the results of the GARCH model fitting on the series of log-returns for the stock market indexes.

Figure 1: Volatility dynamics for stock market indexes of Austria, Belgium and Czech Republic



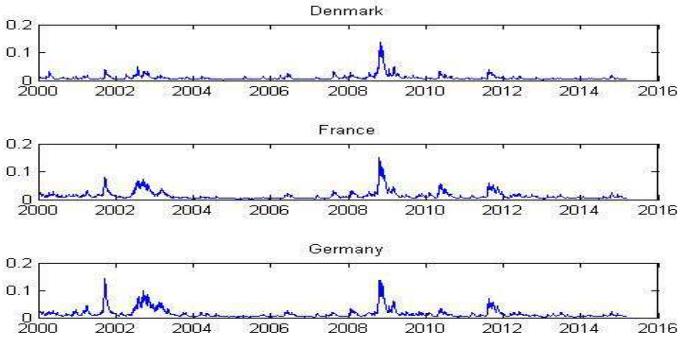
Source: Datastream, author's calculations

The most important element that can be observed is the fact that all indexes show large volatility spikes in the same moment, i.e. the September 2008. In figure 1 we notice that Austria and Belgium seem to have the same level of volatility outlier for this spike, with larger values for the Austrian stock market (the Belgium is presented at a different scale). The Czech Republic seems to show a large level of volatility in the case of September 2008 and relatively less connected levels of volatilities for the rest of the sample, which proves its emerging market status.

If we are to consider the simultaneity of the volatility spikes as proof of contagion, then we can notice that Austria and Belgium seem to be more connected that each of them with the volatility dynamics of the Czech Republic stock index.

Figure 2 shows the volatility dynamics for Denmark, France and Germany, which visually look very connected if we observe the simultaneity of the spikes. As in the previous case for Austria and Belgium we notice that these three countries show low levels of volatility after a spike that took place at the beginning of 2012, a moment that marks the shift in the monetary policy decisions generating insurance that the state will do "whatever necessary" to save the markets. This denotes a moment that announced the soon to be announce Quantitative Easing set of monetary policy decisions.

Figure 2: Volatility dynamics for stock market indexes of Denmark, France and Germany



Source: Datastream, author's calculations

Figure 3 shows the dynamics of volatilities for the rest of the countries in our sample. We notice that Portugal shows a different set of dynamics from this perspective in the pre-crisis period. However, the after-crisis period seems similar for all the four countries in the figure.

We can conclude that the large movements in volatility dynamics are rather simultaneous for all the countries in the sample. We can mention the spikes at the beginning of 2002, the one in September 2008, a smaller one in 2010 and a larger one in 2012. This observation is consistent with the phenomenon of contagion, i.e. large correlations when returns are negative (and consequently exhibit large volatilities due to the Black's leverage effect) and not so

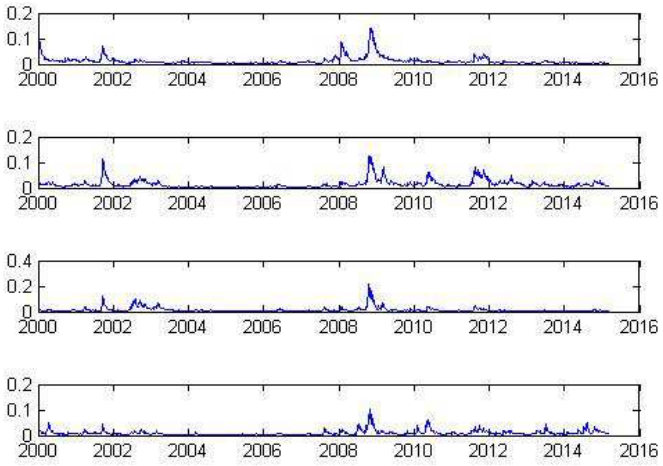
large connections when the returns are positive and markets may present small volatility movements.

In all the cases, the low volatility levels present after the last spike in 2012 represent a period of increased confidence in the new vision of the monetary policies and they can be corroborated with the positive trends in the markets. Portugal and Italy have the largest values of volatilities in this period, which is consistent with their macroeconomic status in a large part of this time sample, related to their credit difficulties.

The results of the MIDAS dependence analysis are presented in tables 2 for the whole sample under analysis and in tables 3 and 4 for the two periods marking the before-the-crisis and during-the-crisis time spans.

With very few exceptions, we can notice that these connections are not statistically significant in general. We appreciate this result as a proof of the fact that the GDP data is not determined by the dynamics of the stock market volatilities, which represent a measure of risk. The result is true for the whole sample and for each of the two sub-samples in our analysis.

Figure 3: Volatility dynamics for stock market indexes of Hungary, Italy, Netherlands and Portugal, respectively



Source: Datastream, author's calculations

The most notable exception for the whole sample analysis is represented by Germany, in which case we have a large T-statistic. Taking into account the fact that the volatility dynamics for Germany are quite similar to those of France (mainly) and to a lesser extend those of Belgium, Denmark and Netherlands, this result shows that the risk in the investments in Europe is mainly driven by the German macroeconomic dynamics via its stock markets.

Table 2

MIDAS regression results for each country for the whole sample period covering January 2001 until October 2014

	Coeff	St. Errors	T-Stats	R2	Log-Like	Akaike	Schwartz
AUSTRIA	1.07	0.94	1.13	0.16	99.28	-350.33	-340.11
BELGIUM	-0.36	0.27	-1.33	0.83	133.83	-419.42	-409.20
CZECH REP.	2.01	1.74	1.16	0.16	70.85	-293.47	-283.25
DENMARK	-0.22	NaN	NaN	0.57	125.51	-402.79	-392.57
FRANCE	-0.38	0.61	-0.62	0.51	140.40	-432.55	-422.33
GERMANY	1.46	0.44	3.30	0.17	136.66	-425.08	-414.86
HUNGARY	1.49	1.82	0.82	0.21	54.07	-259.89	-249.68
ITALY	-0.31	0.37	-0.86	0.72	100.82	-353.40	-343.18
NETHERLAND	-0.34	0.24	-1.42	0.57	130.86	-413.48	-403.27
PORTUGAL	-0.06	NaN	NaN	0.55	113.25	-378.25	-368.04

Source: Datastream, author's calculations

The low connections of the macroeconomic dynamics in the European economies is not transmitted to the markets – the markets would probably suffer the most if the German economy is showing a weakness.

Table 3

MIDAS regression results for each country for the first period of our analysis, covering January 2001 until October 2014

	Coeff	St. Errors	T-Stats	R2	Log-Like	Akaike	Schwartz
AUSTRIA	0.56	1.02	0.55	0.15	70.53	-244.57	-236.13
BELGIUM	-0.63	NaN	NaN	0.81	93.31	-290.14	-281.70
CZECH REP.	2.85	1.94	1.47	0.18	50.81	-205.13	-196.68
DENMARK	0.60	0.94	0.63	0.54	84.23	-271.97	-263.53
FRANCE	-0.38	0.81	-0.48	0.44	94.72	-292.95	-284.51
GERMANY	1.25	0.73	1.72	0.10	91.21	-285.93	-277.48
HUNGARY	0.93	1.32	0.70	0.19	40.31	-184.14	-175.69
ITALY	-3.02	3.63	-0.83	0.73	69.23	-241.98	-233.54
NETHERLAND	-0.38	0.30	-1.29	0.54	91.76	-287.04	-278.59
PORTUGAL	1.09	1.08	1.01	0.71	84.37	-272.26	-263.82

Source: Datastream, author's calculations

However, looking at the two sub-samples, the dynamics of the volatilities cannot significantly explain the macroeconomic movements in the case of Germany. We notice a higher level for the T-statistic in the pre-crisis period, but not significant.

If no significance could be detected in the pre-crisis period for any of the countries in our sample, we notice the exception of Portugal in the second sub-sample.

Table 4

MIDAS regression results for each country for the second period of our analysis, covering January 2010 until December 2009

	Coeff	St. Errors	T-Stats	R2	Log-Like	Akaike	Schwartz
AUSTRIA	3.33	1.94	1.72	0.27	30.42	-96.24	-92.38
BELGIUM	-0.56	0.38	-1.48	0.89	39.66	-114.72	-110.86
CZECH REP.	3.09	2.70	1.14	0.29	22.27	-79.94	-76.08
DENMARK	-1.02	0.82	-1.24	0.77	43.81	-123.02	-119.16
FRANCE	-0.89	0.57	-1.54	0.78	47.45	-130.31	-126.44
GERMANY	-0.30	0.29	-1.03	0.08	42.02	-119.45	-115.58
HUNGARY	5.96	3.92	1.52	0.34	15.68	-66.77	-62.91
ITALY	-0.23	0.40	-0.58	0.69	30.93	-97.27	-93.40
NETHERLAND	-0.29	0.39	-0.75	0.69	38.18	-111.77	-107.90
PORTUGAL	-15.70	2.78	-5.64	0.76	42.50	-120.41	-116.55

Source: Datastream, author's calculations

We take notice of the fact that in general neither of the two samples generated enough evidence to consider that there exists a relation between the macroeconomic developments and the stock market volatilities.

5. Concluding Remarks

This paper provides an analysis of the volatility of stock market indexes for a set of ten countries for the period between January 2001 and October 2014. Taking into account the stylized facts noted in the literature for the daily stock market log-returns we observed that the volatility dynamics exhibit the phenomenon of contagion, i.e. low levels during the period of increases (especially before September 2008) and large levels during the crisis. These observations are consistent also with the fact that large spikes in the volatilities are mostly simultaneous across all the ten countries in our sample, irrespective of their level of development – so both for the developed and emerging markets.

The next step of our analysis consisted in the analysis or the connections between volatilities on one hand, which are usually

interpreted as measures for the investment risk in an economy in general (for those economies in which the stock market represents a large portion of the economic activity) and changes in the GDP per capita, on the other hand. The study dealt with the division of the sample in two sub-samples, one for the pre-crisis period and the second for the after-crisis period. In general no significant connection was found between the two series, using a MIDAS methodology that solves the problem of different frequencies. For the whole sample Germany showed a significant connection, which means that, if we consider the risk to be similar (at least across developed European countries) then the German economy has the largest probability to generate clientele for the European stock markets.

Acknowledgement

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A VOLATILITY ANALYSIS OF THE EURO CURRENCY AND THE BOND MARKET

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Abstract

This paper aims to study the dynamics of the volatilities of euro currency pairs and bond markets and seeks to determine the possible connections between the two. For this purpose the methodology involves three types of GARCH models calibrated on series of six euro currency pairs and on 10–year maturity government bonds from the corresponding countries. The results indicate that the volatilities of the currency returns are connected to the corresponding governmental bond returns. Taking into account the fact that these bonds react mostly to macroeconomic events, we can conclude that new events impacts the volatility of currency returns at the daily frequency.

Keywords: volatility, currency markets, bond markets

JEL Classification: G15, G17

1. Introduction

The European Monetary Union represents the most relevant project that impacted the international financial system since the demise of the Bretton-Woods system. A detailed presentation of the European monetary integration process is made by Criste (2012) and Criste and Lupu (2015). The prospect of a financial market at continental proportions that is not subjected to exchange rate risk represented a key move to a complete financial integration. The relevance of the monetary union for bond markets is obvious and has been highlighted in studies like Bernoth et al. (2004). A powerful literature investigates the benefits and the capital role played by the euro in the evolution of bond markets and the international financial contagion is presented in Lupu (2012).

The purpose of this paper is to scrutinize the volatility of the euro currency and to search for linkages with the volatilities of several European and international bond markets. In order to achieve this objective the modeling context incorporates three models belonging

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to the GARCH class. The study thus gravitates around six currency pairs: EUR - AUD, EUR - CAD, EUR - CHF, EUR - GBP, EUR - JPY and EUR - USD and the 10 year government bonds of the states corresponding to the currency pairs (Australia, Canada, Switzerland, United Kingdom, Japan and United States).

The reminder of this paper is structured in the following manner. Section II provides a brief glimpse into similar scientific investigations. Section III describes the data and the methodology on which the study is based. Section IV covers the results obtained and their interpretation and the last section concludes.

2. Literature review

During the past decades the literature aiming at observing the linkages of different financial components has flourished into a powerful block of academic consideration. The present research relates to several areas of this literature.

Seminal research conducted by Engle, Ito and Lin (1990) and Andersen and Bollerslev (1998) generated key contributions in the investigation of the volatility of foreign exchange markets. Both studies document on spillover effects.

Ehrman et al (2011) bring forth a study that focuses on the relations between several financial sectors such as the exchange rates, bond, equity and money markets for the US and the euro zone. They report that asset prices tend to react in a powerful way to the shifts of the prices of other domestic assets. Another conclusion of the study is that before the EMU the level of international spillovers was significantly smaller. Albu et al (2014a) and Albu et al (2014b) focus on the reaction of European sovereign CDSs to certain events of quantitative easing. Similar investigations are present in Lupu and Călin (2014b) and Lupu and Călin (2014c).

Albu et al (2014c) study the relation between market capitalization and GDP per capita by using a nonlinear model that translates into a convergence based approach.

Ulrich and Wachtel (1981), Goldberg and Leonard (2003) and Ehrmann and Fratzscher (2004) demonstrate that bond markets are sensitive to news about macroeconomic fundamentals while Ito and Roley (1987) and Almeida et al. (1998) advocate the same for currency markets.

Lupu and Calin (2014a) use the MIDAS method in order to exhibit the linkages between macroeconomic growth and the stock market for a series of countries in Central and Eastern Europe. The authors report only slight dependences between the two investigated

variables, while in Lupu and Lupu (2009) is investigated the issue of contagion across Central and Eastern European stock markets using a dynamic conditional correlation test.

The literature considering exchange rate volatility is also extensive. De Grauwe et al. (1985) document on the relation between the oscillations of exchange rates and the variability of monetary shocks.

Flood and Rose (1995) investigate the impact of macroeconomic fundamentals on exchange rates focusing on both fixed and floating ones. They report a lack of influence from the macroeconomic variables.

Calderón (2004) studies the volatility of real exchange rates and observes that their levels can't be reduced by the increase of international trade.

An important number of exchange rate volatility studies incorporate in their methodology various types of GARCH models.

Bauwens et al. (2006) focus on the volatility of the Norwegian krone. Using an EGARCH model, the authors highlight a positive and statistically significant impact generated by new information.

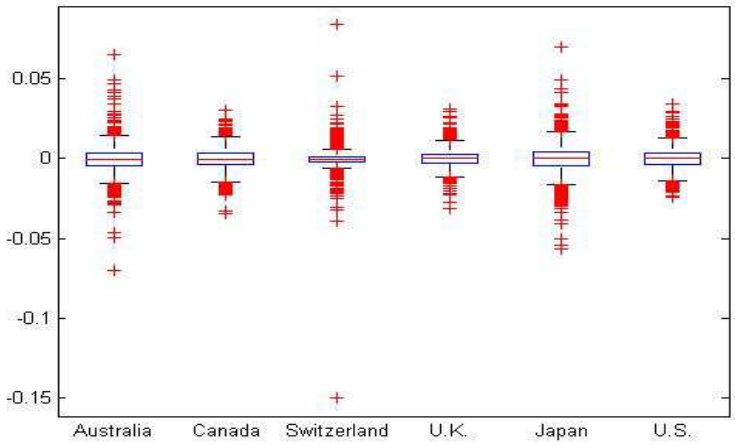
Fidrmuc and Horváth (2008) investigate the exchange rate movements for a series of recent EU member states by the means of both a GARCH and a TARCH model. The study reports high levels of volatility which come from a reduced level of credibility of local exchange rate management. Similar and more recent contributions can be found in Ahmed (2012) or Lupu et al (2014).

3. Data and Methodology

The data is provided by Bloomberg and consists in the following series of currencies: EURAUD, EURCAD, EURCHF, EURGBP, EURJPY and EURUSD. For the same time frame we also downloaded data for the 10-year maturity governmental bonds for the respective country pairs (Australia, Canada, Switzerland, United Kingdom, Japan and United States). These prices were collected with a daily frequency from January 2007 until February 2015. They cover a wide spectrum of events that encompass both the inception of the crisis and its evolvement in the following years.

The main characteristics of this series is presented in figure 1, where we show the boxplots of the log-returns for the pairs the Euro currency with all the countries mentioned above.

Figure 1: The returns of the currency pairs



We notice that they seem to have symmetrical distributions and large tails as the usual series of log-returns for financial assets in general. The largest range belongs to the distribution of the EURJPY returns as well as for the EURAUD returns.

As stated above, we are analyzing the volatility of the euro currency at the daily frequency and we study its connection with the volatilities of the bond markets.

In this respect we are using three GARCH models: the classical GARCH model, the APARCH model and the FIGARCH model for the period from January 2007 until February 2015.

The GARCH model derives from the work of Bollerslev (1986) and represents the general form of Engle's (1982) ARCH procedure. It allows the the use of passed conditional variances in the form of the present variances. The general form of the model is the following:

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{m} \alpha_i a_{t-i}^2 + \sum_{j=1}^{s} \beta_j \sigma_{t-j}^2$$

where:

$\alpha_0 > 0, \alpha_i \geq 0, \beta_j \geq 0$

The Asymmetric Power ARCH (APARCH) was devised by Ding et al. (1993) and is capable of capturing the asymetry of volatilies. It's specification is the following:

$$y_t = \mu + a_t$$

$$a_t = \sigma_t \epsilon_t$$

$$\sigma_t^{\delta} = \omega + \sum_{i=1}^{m} \beta_i \sigma_{t-i}^{\delta} + \sum_{j=1}^{s} \alpha_j \left(|a_{t-j}| - \gamma_j a_{t-j} \right)^{\delta}$$

where

$\omega > 0, \delta \geq 0$

$\beta_i \geq 0$

$\alpha_j \geq 0$

$-1 < \gamma_j < 1$

Baillie et al. (1996) introduced the Fractionally Integrated GARCH which relies on the following formulation:[1]

$$\varphi(L)(1-L)^d a_t^2 = \omega + [1 - \beta(L)]v_t$$

$$\sigma_t^2 = \frac{\omega}{1-\beta(L)} + \left\{ 1 - \frac{\alpha(L)(1-L)^d}{1-\beta(L)} \right\} a_t^2 = \frac{\omega}{1-\beta(L)} + \lambda(L) a_t^2$$

4. Results

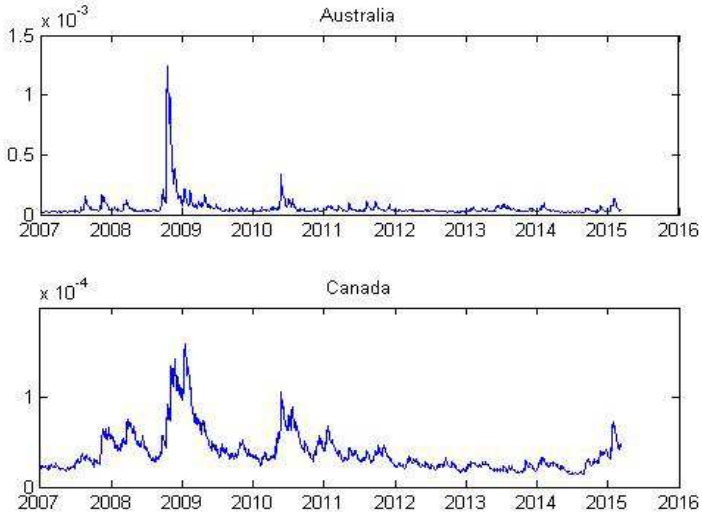
Figure 2, 3 and 4 below show the volatilities of the log-returns for the Euro currency pairs with all the counterparts from the countries in our analysis for the whole data sample. The volatilities presented here are the result of the fitting of a simple GARCH(1,1) model. Similar trends were obtained by using the other two specifications mentioned in the previous section.

For all the series, except EURCHF (due to its setting), we notice first the spike in 2008, which is consistent with the manifestation of a reaction of markets to the bankruptcies of major banks in the US, which triggered a wide range of events that were perceived at the global level. These reactions in the volatilities of currencies were clear and quite sudden, looking more like jumps in the dynamics of these log-returns, in the case of few countries (especially for Australia, Japan and to a lesser level UK) but they

[1] *For a discussion on GARCH modeling see for example Lupu and Lupu (2007) or Călin et al. (2014)*

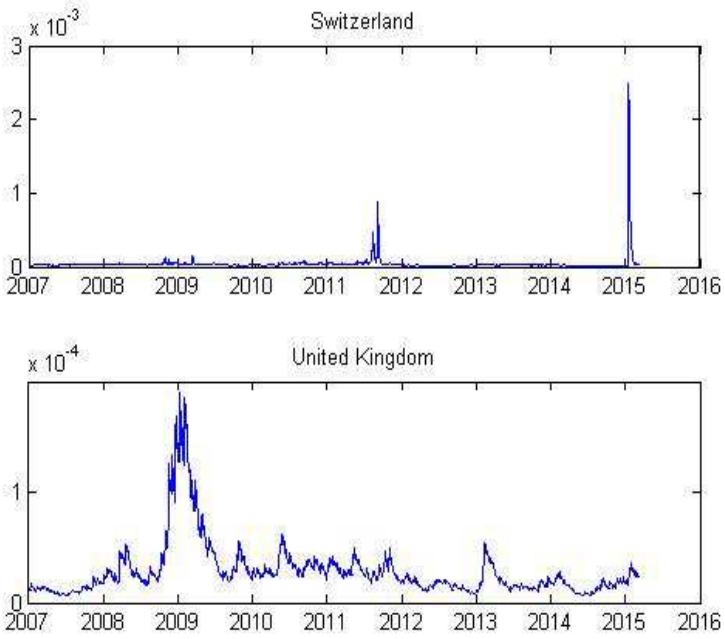
seem to have some amount of persistence in the case of US and Canada (which are known to be very correlated due to the close connection of the two economies). This persistence shows the lack of clear reaction of authorities to the manifestation of the crisis and the time needed for the generation of a strategy.

Figure 2: Volatilities of log-returns for EURAUD and EURCAD



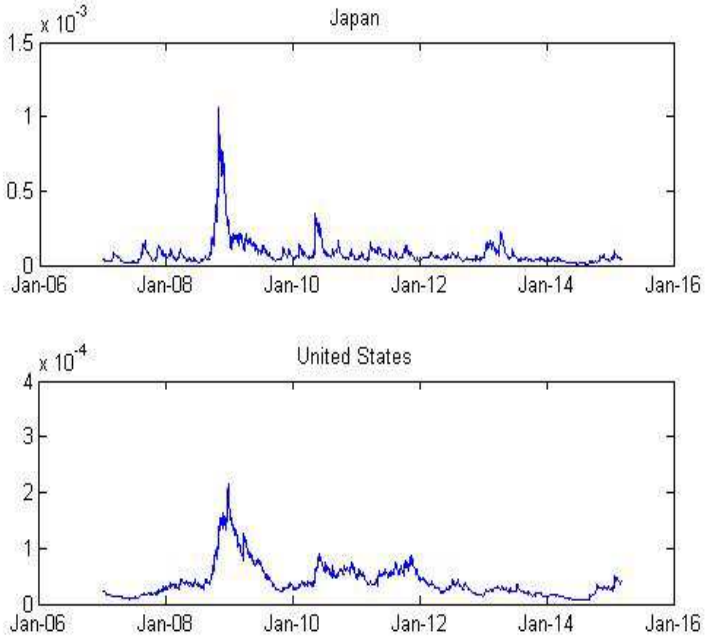
For Australia and Canada figure 2 shows a second spike (more pronounced in the case of Canada) around 2010 and beginning of 2011, which is also consistent with monetary policy reactions. The Quantitative Easing process that developed widely in the US impacted all of these countries and was clearly perceived as a clear shift in the monetary policy, with central bank officials affirming their determination to intervene in the markets in the sense that they would react as well as possible to save the economies. A close monitoring of macroeconomic statistics followed and a large dependence on the estimation of market expectations became the focus of most policy reactions.

Figure 3: Volatilities of log-returns for EURCHF and EURGBP



If for the case of Australia, Canada, UK, Japan and US we could consider the volatility dynamics as representing the result of both evolutions of the European countries and their counterparties, in the case of the EURCHF, the volatility dynamics show the results of the dynamics of Euro. We notice that the spike at the beginning of 2012 is correlated with the above mentioned shift in the monetary policy strategies and we see that the rest of the changes cover mostly low dynamics with some low reactions during the crisis in 2008. On the other hand, the large jump in 2015 reflects the well-known reaction of the Central Bank of Switzerland to relax the connection of CHF with the Euro, so this is a reaction before the large scale Quantitative Easing process to be developed in Europe.

Figure 4: Volatilities of log-returns for EURJPY and EURUSD



The volatilities of the EURJPY show both the dynamics of the European economies as well as the expectations of Kuroda's monetary policy to increase inflation in Japan as part of the well-known *Abenomics* policy. On the other hand the volatilities dynamics of the EURUSD in the second part of figure 4 shows a persistence of the large values from 2008 until 2010 and an increase during 2010 and 2012, where we could say that the monetary policies tried to identify the best strategies for the following years. Once the Quantitative Easing process was settled, the market reactions were less uncertain (as we can see smaller volatilities during this time). The increase from the end of 2014 could be associated with the uncertainty about the new Quantitative Easing program in Europe and the rate cuts of many central banks at the beginning of 2015.

Table 1

Results of regressions of volatilities of log-returns of Euro currency pairs on the dynamics of log-returns of the governmental bond markets

			Coefficients	Low 95%	High 95%
Australia	GARCH	Intercept	5.07731E-05	4.63E-05	5.52E-05
		Beta	0.030544809	0.022104	0.038986
	APARCH	Intercept	5.04095E-05	4.59E-05	5.49E-05
		Beta	0.032512893	0.024046	0.04098
	FIGARCH	Intercept	5.28084E-05	4.84E-05	5.73E-05
		Beta	0.033429343	0.025016	0.041843
Canada	GARCH	Intercept	3.75788E-05	3.65E-05	3.87E-05
		Beta	0.00322369	0.001611	0.004837
	APARCH	Intercept	3.75196E-05	3.64E-05	3.86E-05
		Beta	0.003226608	0.001623	0.00483
	FIGARCH	Intercept	3.74031E-05	3.64E-05	3.84E-05
		Beta	0.003120175	0.001594	0.004647
Switzerland	GARCH	Intercept	3.76015E-05	3.37E-05	4.15E-05
		Beta	-3.38693E-05	-4.2E-05	-2.6E-05
	APARCH	Intercept	5.14793E-05	3.92E-05	6.37E-05
		Beta	-8.27027E-05	-0.00011	-5.8E-05
	FIGARCH	Intercept	3.56542E-05	3.07E-05	4.06E-05
		Beta	-8.51695E-05	-9.5E-05	-7.5E-05
UK	GARCH	Intercept	2.88882E-05	2.77E-05	3E-05
		Beta	-0.00047788	-0.00162	0.000666
	APARCH	Intercept	2.92542E-05	2.8E-05	3.05E-05
		Beta	-0.000952045	-0.00218	0.000277
	FIGARCH	Intercept	2.85112E-05	2.75E-05	2.96E-05
		Beta	-0.000570645	-0.00161	0.000464
Japan	GARCH	Intercept	7.91036E-05	7.5E-05	8.32E-05
		Beta	0.0001112	-0.00107	0.001297
	APARCH	Intercept	7.38952E-05	7.04E-05	7.74E-05
		Beta	0.000138737	-0.00088	0.001157
	FIGARCH	Intercept	7.60432E-05	7.23E-05	7.97E-05
		Beta	9.99867E-05	-0.00097	0.001174

			Coefficients	Low 95%	High 95%
US	GARCH	Intercept	3.72542E-05	3.59E-05	3.86E-05
		Beta	0.005839648	0.004791	0.006888
	APARCH	Intercept	3.72754E-05	3.59E-05	3.86E-05
		Beta	0.005785298	0.004772	0.006799
	FIGARCH	Intercept	3.7809E-05	3.64E-05	3.92E-05
		Beta	0.005984743	0.00489	0.00708

With very few exceptions we notice that there is a clear connection between the volatilities of currency pairs and the log-returns of the bond market for governmental bonds. Taking into account the fact that usually these bonds react mostly to macroeconomic events and monetary policy decisions rather than market speculation, especially in the period covered by this sample, we can conclude that new events impacts the volatility of currency returns at the daily frequency.

5. Concluding remarks

This paper provides an analysis of the possible connections of the volatility dynamics of the main Euro currency pairs and the dynamics of the log-returns for the governmental bond market of these respective countries. The set of volatilities was obtained by the use of three GARCH models and the connections were performed using the simple regression for each series of volatilities. The results show consistence of the found volatilities with the main macroeconomic events and the existence of the dependence as mentioned seen in the regression models. We can conclude that the volatilities of the currency pairs react quite promptly to the macroeconomic events.

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LIQUIDITY AND INFORMATIONAL INEFFICIENCY. THE CASE OF ROMANIA

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Abstract

The theory of financial markets developed by Eugene Fama was one of the conceptual bases of the studies trying to explain the financial assets' price changes. This theory was also important for the development of certain segments of the financial industry, such as mutual funds, in terms of supporting the development and diversification of these funds, understanding the raise in the value of the assets under administration and the importance of this segment within the financial market.

We shall test the efficient market hypothesis on the Romanian capital market, using the closing values of the BET index (the most important index for the Bucharest Stock Exchange) for the period January 3rd, 2007 – March 13, 2015. We perform the unit root tests, Jarque-Bera test, multiple variance ratio test and the GARCH model. The results of the study show that the Romanian capital market does not present the weak form of informational efficiency. A possible explanation comes from the low liquidity of the Romanian capital market, so that the price of the listed companies is not a relevant measure for the intrinsic value of those companies.

Keywords: efficient market, capital market, index, return

JEL Classification: G14, G15

1. Introduction

A milestone work of the Chicago School followers, whose validity was questioned by the recent global financial crisis (some saying that this theory is obsolete), the Efficient Market Hypothesis (EMH) was developed by Eugen Fama at the beginning of the 1960's, one of the first models being presented in his PhD dissertation at the University of Chicago Booth School of Business. According to the EMH, in an active market for financial instruments, where the participants have access to all the available and relevant information related to a company, the current price reflects all these information.

In one of the definitions of the informational efficient market, Eugene Fama takes into consideration the requirement that the

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market participants are rational, and their number is high, acting in a manner that makes possible for them to maximize their own return (in order to do that, they try to estimate the future prices of the financial instruments, considering all the available information). Moreover, in order for the price to reflect in a short time the new available information related to a company, a necessary requirement for the validity of the EMH is that the market should be liquid (such that exists some transmission mechanism of the information into the price).

After more than 50 successful years in both the academic and practitioners' fields, the EMH was seriously under question by the occurrence of some extreme events, hardly anticipated and explained by this theory. Such events were the 16% drop of the Dow Jones index in less than 3 weeks in July 2002 (from 9,250 points to 7,750 points), the 70% plunge of the index of high-tech companies listed on NASDAQ stock exchange in March, 2000-Ooctober, 2002, or the 50% drop of the US markets between March, 2008-March, 2009.

In this article, we briefly analyze the EMH validity of the Romanian capital market, using the closing values for the BET index in January, 3rd, 2007 – March, 13th, 2015. Moreover, we will discuss about the illiquidity of the Romanian capital market that seems to be one of the main causes of the informational inefficiency of the market.

2. Main Concepts Of Emh

Decisions made by rational investors (mainly institutional investors, as well as individuals) are the result of extensive and complex analysis of all the factors that characterize the market and the domain in which the company operates, both macroeconomics (trends of the economy/economies in which the company operates, changes in the specific legislation, social, political or economic movements/developments etc.), and microeconomics and company specific factors (information regarding the financial reports, corporate events etc.).

As a consequence, understanding the characteristics of the capital market in which the issuer is traded is essential for making the adequate decision to enter the market. One of the checks that can be done relates to testing the validity of the EMH. To this purpose, several statistical tests were proposed and used, to verify whether the market is informational efficient (meaning that the future prices of the financial instruments cannot be derived from the past values), namely unit root test, Jarque Bera test, multiple variance ratio test or GARCH model, applied on the most representative market indexes.

First tests of the informational efficiency of the capital markets were done at the beginning of the 1960's, by Eugene Fama (1965),

who countered the chartist theory, very popular since the beginning of the XX century, saying the past price evolution repeat itself, such that we can find some patterns. Afterwards, new testing methods have been proposed, some of them being very often used, as the one proposed by Lo and McKinlay (1988, 1990), that is known as the multiple variance ratio test (the most relevant test used for testing the informational efficiency). Using the data for the US market, Lo and MacKinlay (1999) found that the US capital market is not weak-form efficient, countering Eugene Fama's conclusions. Tests of the EMH validity were made using the data for almost every market in the world, some of them validating the hypothesis (for example, Worthington and Higgs, 2004, 2005, Gupta and Yang, 2011, or Khan, Ikram and Mehtab, 2012, Malkiel, 2012), some of them rejecting that hypothesis (as in the works of Sharma and Narayan, 2011, Harper and Jin, 2012).

Testing the EMH on the Romanian capital market was made by Codârlaşu (2000), that rejected this hypothesis, similar conclusions being obtained by Dragotă and Mitrică (2004), Stănculescu and Mitrică (2012), Dragotă and Oprea (2014).

3. Testing The Emh On The Romanian Capital Market

Even though the first institutions of the capital market were set-up at the beginning of the 1990s (by the creation of an Agency of Securities as a subsidiary of the National Bank of Romania), we cannot say that in Romania a real capital market is functioning, as the stock exchange is not yet a solid environment where the available capitals from the economy are allocated to the companies searching financial support for their investment plans. This fact can be easily seen from the marginal place of the capital market as an environment that provides financial resources for the Romanian economy, compared to the banking system (for example, the balance of the loans for nonfinancial companies being, at the end of January, 2015, at the level of 104.3207 billion lei).

Moreover, even though the Bucharest Stock Exchange opened its trading sessions for almost 20 years, the stock exchange still plays a marginal role in the Romanian financial system, fact that is indicated by the level of the market capitalization in the Gross Domestic Product (that was, at the end of February, 2015, at 20%, a level comparable with that of Bulgaria, but far away from the Poland, that has over 40%).

The evolution of the Romanian capital market can be assessed from the indexes of the Bucharest Stock Exchange, the most well-known being the BET index, launched in September, 19th, 1997, as a free float market capitalization weighted index of the 10

most liquid companies listed on the Bucharest Stock Exchange. The specific behavior of the Romanian stock market during 2007-2009 was analyzed by Panait and Lupu (2009), the main conclusion being that the more pronounced influence of the crisis is an aftermath of maturity lack of Romanian stock exchange.

We shall analyze the BET evolution in January, 3rd, 2007-March, 13, 2015 and use the closing values to perform the unit root test, Jarque Bera test, multiple variance ratio test and GARCH model.

Starting from this time series, we test whether the logarithmic series is stationary, using the unit root test (or Dickey Fuller test). Performing this test, we see that calculated t-statistic is -1.550021, a value that is in absolute value less than the critical levels at 1%, 5% and 10%. As a consequence, the Dickey Fuller test shows the presence of the unit root in the logarithmic series.

Table 1

The Dickey Fuller test for BET index (03.01.2007-13.03.2015)

Null Hypothesis: LOG_BET has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.550021	0.5081
Test critical values:	1% level	-3.433214	
	5% level	-2.862691	
	10% level	-2.567429	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_BET)
Method: Least Squares
Date: 03/17/15 Time: 23:19
Sample (adjusted): 1/05/2007 3/13/2015
Included observations: 2136 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_BET(-1)	-0.001756	0.001133	-1.550021	0.1213
D(LOG_BET(-1))	0.094475	0.021550	4.384018	0.0000
C	0.015067	0.009775	1.541305	0.1234
R-squared	0.009908	Mean dependent var		-8.26E-05

Adjusted R-squared	0.008979	S.D. dependent var	0.016677
S.E. of regression	0.016602	Akaike info criterion	-5.357222
Sum squared resid	0.587889	Schwarz criterion	-5.349263
Log likelihood	5724.513	Hannan-Quinn criter.	-5.354309
F-statistic	10.67211	Durbin-Watson stat	1.991651
Prob(F-statistic)	0.000024		

Source: www.bvb.ro, own calculation

We continue by finding the integration degree of the logarithmic series that can be seen by applying the unit root test on the first difference. The result is presented in the following table. We can see that the null hypothesis can be rejected, as the absolute value of the t-statistic is greater than the critical values for the 1%, 5% and 10% levels. So, the daily return of the BET index is stationary and, as a consequence, this series is not a random walk.

Table 2

The Dickey Fuller test for the daily returns of the BET index (03.01.2007-13.03.2015)

Null Hypothesis: DL_BET has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-42.04833	0.0000
Test critical values:	1% level	-3.433214	
	5% level	-2.862691	
	10% level	-2.567429	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DL_BET)
Method: Least Squares
Date: 03/17/15 Time: 23:56
Sample (adjusted): 1/05/2007 3/13/2015
Included observations: 2136 after adjustments

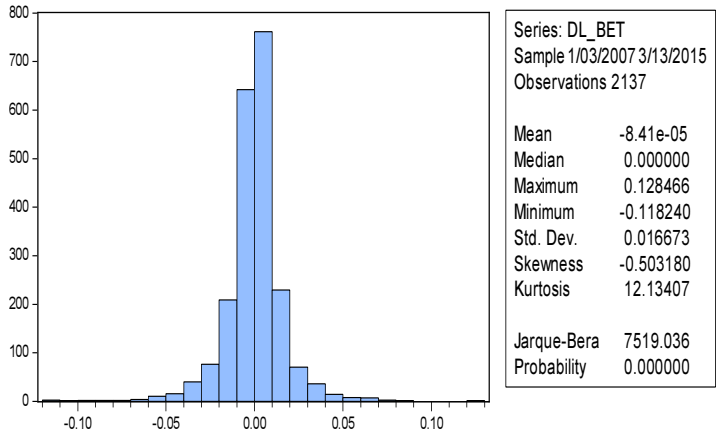
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DL_BET(-1)	-0.906232	0.021552	-42.04833	0.0000
C	-7.50E-05	0.000359	-0.208616	0.8348
R-squared	0.453110	Mean dependent var		-8.20E-07

Adjusted R-squared	0.452853	S.D. dependent var	0.022451
S.E. of regression	0.016607	Akaike info criterion	-5.357032
Sum squared resid	0.588551	Schwarz criterion	-5.351726
Log likelihood	5723.310	Hannan-Quinn criter.	-5.355091
F-statistic	1768.062	Durbin-Watson stat	1.991561
Prob(F-statistic)	0.000000		

Source: www.bvb.ro, own calculation

Another test used to assess the informational efficiency of the market tries to find whether the daily return series follows a normal distribution. In order to find that, we use the Jarque Bera test, whose results show that the daily return series is not normal.

Figure 1: The Jarque-Bera test for the daily returns of BET index (03.01.2007-13.03.2015)



Source: www.bvb.ro, own calculation

Comparing the details of the statistics of the daily return series for BET index with the details of a normal distribution, we can see that the first series is not normal. This conclusion can be drawn from the fact that the Jarque Bera test shows a slightly negative mean (-0.0000841) for the daily return of the BET index, and the standard deviation is 0.016673. Also, the distribution is steeper than the normal distribution (*that means that many values are concentrated around the mean*), and the Kurtosis is 12.13, much larger than 3 (*the value corresponding to a normal distribution*). Furthermore, the skewness is negative (-0.503180), so the distribution is left-side asymmetric, that means that the returns are greater than those estimated by the normal distribution. Since the Jarque-Bera test leads to the conclusion that the daily return is not a normal distribution, the weak-form efficiency is rejected for the Romanian capital market.

One of the most powerful test used for assessing the informational efficiency of the capital market is the multiple variance ratio test, that takes into consideration 2-, 4-, 8- and 16-days intervals. Under the assumption that the errors are heteroskedastical, we obtain the following result:

Table 3

Multiple variance ratio test for daily returns of BET index (*errors are heteroskedastical*)

Null Hypothesis: DL_BET is a martingale
Date: 03/18/15 Time: 00:21
Sample: 1/03/2007 3/13/2015
Included observations: 2136 (after adjustments)
Heteroskedasticity robust standard error estimates
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 2)*	9.123886	2136	0.0000

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.567886	0.047361	-9.123886	0.0000
4	0.272590	0.087185	-8.343268	0.0000
8	0.130488	0.128976	-6.741659	0.0000
16	0.064703	0.176686	-5.293553	0.0000

*Probability approximation using studentized maximum modulus with parameter value 4 and infinite degrees of freedom

Test Details (Mean = -8.20358946643e-07)

Period	Variance	Var. Ratio	Obs.
1	0.00050	--	2136
2	0.00029	0.56789	2135
4	0.00014	0.27259	2133
8	6.6E-05	0.13049	2129
16	3.3E-05	0.06470	2121

Source: www.bvb.ro, own calculation

Applying the multiple variance ratio test, we see that the biggest value is obtained (in absolute value) for the 2-days interval (equal to 9.123886). In order to test whether the null hypothesis is rejected, we compare these results with the critical value for the Studentized Maximum Modulus distribution (*with m parameters and ∞ degrees of freedom*) and, as a consequence, the null hypothesis is rejected (*since all the calculated values have an absolute value that is*

bigger than 2.49). This means that the series of daily returns of the BET index is not a martingale and, therefore, the Romanian capital market is not weak-form informational efficient.

We will apply the same test, considering that the errors are homoskedastical, finding the next results:

Table 4

Multiple variance ratio test for daily returns of BET index (errors are homoscedastic)

Null Hypothesis: DL_BET is a random walk
Date: 03/18/15 Time: 00:30
Sample: 1/03/2007 3/13/2015
Included observations: 2136 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 2)*	19.97098	2136	0.0000
Wald (Chi-Square)	410.0410	4	0.0000

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.567886	0.021637	-19.97098	0.0000
4	0.272590	0.040479	-17.96991	0.0000
8	0.130488	0.064003	-13.58539	0.0000
16	0.064703	0.095240	-9.820399	0.0000

*Probability approximation using studentized maximum modulus with parameter value 4 and infinite degrees of freedom

Test Details (Mean = -8.20358946643e-07)

Period	Variance	Var. Ratio	Obs.
1	0.00050	--	2136
2	0.00029	0.56789	2135
4	0.00014	0.27259	2133
8	6.6E-05	0.13049	2129
16	3.3E-05	0.06470	2121

Source: www.bvb.ro, own calculation

Analyzing these results, we can observe that the absolute values calculated for 2-, 4-, 8- and 16 days intervals are bigger than the critical value of the Studentized Maximum Modulus distribution (with m parameters and ∞ degrees of freedom) and, therefore, the null hypothesis is rejected. We can say that the null hypothesis, or that the series of the daily returns is martingale, is rejected, that

means that the Romanian capital market is not weak-form informational efficient.

Another test used for assessing the informational efficiency of the capital market is the GARCH (1,1) model, that presumes that the return follows an autoregressive process ARMA (1,1). The results of this test are summarized in the following table:

Table 5

GARCH model for daily returns of BET index (05.01.2007-13.03.2015)

Dependent Variable: DL_BET
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 03/18/15 Time: 00:39
Sample (adjusted): 1/05/2007 3/13/2015
Included observations: 2136 after adjustments
Convergence achieved after 17 iterations
MA Backcast: 1/04/2007
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
AR(1)	-0.183775	0.215884	-0.851270	0.3946
MA(1)	0.276730	0.210549	1.314325	0.1887
Variance Equation				
C	4.45E-06	5.92E-07	7.518187	0.0000
RESID(-1)^2	0.191359	0.009955	19.22252	0.0000
GARCH(-1)	0.806937	0.009057	89.09871	0.0000

R-squared	0.009928	Mean dependent var	-8.26E-05
Adjusted R-squared	0.009464	S.D. dependent var	0.016677
S.E. of regression	0.016598	Akaike info criterion	-5.921238
Sum squared resid	0.587876	Schwarz criterion	-5.907973
Log likelihood	6328.882	Hannan-Quinn criter.	-5.916383
Durbin-Watson stat	1.990915		

Inverted AR Roots	-.18
Inverted MA Roots	-.28

Source: www.bvb.ro, own calculation

From this table we see that the AR(1) and MA(1) coefficients are not statistically significant, as their related probabilities are 0.3946 and 0.1887, respectively. This means that an attempt to estimate the daily returns of the BET index using an autoregressive process

ARMA is not adequate, since the resulted equation is not stable (*as the coefficients are not statistically significant*).

On the other hand, the volatility can be expressed by the equation:

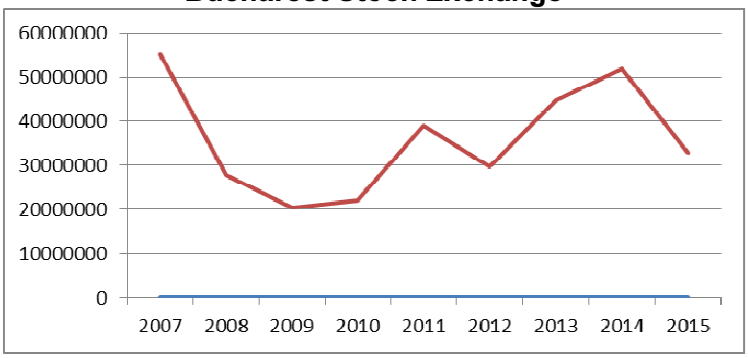
σ_t=0.00000445 + $0.191359\sigma_{t-1}$+ $0.80693768\varepsilon^2_{t-1}$, where all the coefficients are statistically significant at 1% level.

Since we identified an equation that can be used for estimating the daily volatility of the BET index returns, we can conclude that the capital market is not weak-form informational efficient.

These results lead to the conclusion that the Romanian capital market is not informational efficient (*in the weak-form status*), that means that the prices do not reflect all available past information related to the listed companies. Is this an indication that it is possible to obtain better returns compared to the risk taken on the Romanian capital market? The answer can be derived from the value of daily trading activity on the Bucharest Stock Exchange, as well as their structure, considering whose companies' shares are most traded in current day-to-day operations.

We consider the daily average trading activity on the Bucharest Stock Exchange, for every year in the 2007-2015 timeframe. We observe that, during the time of turbulences on the financial markets (between 2008 and 2010), the average daily trading activity was less than 30 million lei (*with a minimum in 2009, of 20.37 million lei, and a closed value in 2010, of 21.93 million lei*). This evolution is revealed by the following graph:

Figure 2: Daily average trading activity in 2007-2015 on Bucharest Stock Exchange



Source: www.bvb.ro, own calculation

Between 2007 and 2010, the sharp reduction in the average daily trading activity occurred during a time when the traded volume was approximately constant (*in a range of 12.83 billion shares and*

14.43 billion shares) and the number of trades was also constant (*in the range of 1.3-1.5 million*). The apparent improvement for the average daily trading activity in 2012, 2013 and 2014, was mainly due to the initial public offerings started by the Romanian authorities, to the repurchase programs initiated by some listed companies or to the private placements realized by some of issuers (*like those made by Fondul Proprietatea, issuer that was listed in 2011*), anyone of these operations not being recurrent.

Analyzing the structure of the main contributors to the daily trading activity, the period can be divided into two sub-periods, each of them being characterized by some issuers that dominated the trades on Bucharest Stock Exchange. Since the listing of the Fondul Proprietatea in January, 26th, 2011, at least 50% of the daily turnover were the trades with the shares of the 5 Financial Investment Companies (*Banat-Crisana, Moldova, Transilvania, Muntenia and Oltenia*), closed-end funds created as a result of Mass Privatization Program, a fact that indicates a significant concentration of the trading activity of a small number of issuers. After the Fondul Proprietatea initial public offering (*that lead, also, to the increase in the trading activity in 2011*), this company became the most traded issuer and, together with the shares of the 5 Financial Investment Companies, they dominate almost all daily trading activity on Bucharest Stock Exchange (*in most of the days, over 70% of the traded value*).

Taking into consideration these characteristics of the Romanian capital market, we can draw the conclusion that one of the causes for invalidating the EMH is the low liquidity on the Bucharest Stock Exchange, that makes the process of incorporating the new available information in the case of many issuers (*especially, those that are illiquid or are not followed by investors*) to be a lengthy one. Moreover, in the case of the issuers than are not regularly followed by investors, the process of incorporating the new information can lead to large swings in price, to levels that are not fundamentally reasonable and do not reflect the intrinsic value of the companies.

4. Conclusion

Using the data for the BET index (a representative index for the Romanian capital market) in January, 3rd, 2007-March, 13th, 2015, we apply four methods to test the EMH on the Romanian capital market, finding that this hypothesis is rejected. One of the causes for this situation, among others, is the low liquidity on the Bucharest Stock Exchange, that makes the process of incorporating the new available information related to an issuer to have no immediate direct effects (in the case of the companies whose shares

are not followed by investors, have a small free-float or are illiquid) or to have an excessive effect, by amplifying the volatility of the price (to levels that are not relevant and have no basis on the intrinsic value of these companies, but only as a result of the low liquidity).

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APPROACHES OF PUBLIC FINANCE SUSTAINABILITY TAKING INTO ACCOUNT THE CURRENT ECONOMIC CONTEXT[1]

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Abstract

The paper aims to emphasize the approaches of public finance sustainability in the new context created as a result of the fiscal pressures exhibited worldwide, both in advanced and emerging economies. The analysis highlights the need to address public debt sustainability both in terms of deterministic analysis that consider alternative scenarios not only in terms of interest rate, exchange rate, primary balance, economic growth shocks, but also contingent liabilities shocks and in terms of stochastic analysis for a better quantification of the economic agents reactions to changes of public debt level.

Keywords: public debt, alternative scenarios, shocks, fiscal burden indicators

JEL Classification: E62, H63

1. Introduction

Fiscal sustainability deterioration at a global level highlighted the interest of academics, central banks and policymakers for this topic. The economic turmoil manifested recently revealed that a public debt lower than 60% of GDP (according to Maastricht criteria) is not necessarily a sustainable debt, but more fiscal burden indicators are required in order to establish the fiscal sustainability. Moreover, the deterministic analysis used through the intertemporal budget constraint equation that considers interest rate shocks, exchange rate shocks, primary balance of the general consolidated

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budget shocks, economic growth shocks is not enough, requiring also contingent liabilities shocks, consolidated with a stochastic analysis to better quantify the reactions of the economic agents to changes in public debt.

However, in order to understand different approaches appeared under fiscal pressures manifested worldwide, both in advanced economies and emerging economies, an analysis of the public debt dynamics is required emphasizing the operating mechanism (Ali Abbas et al., 2013). Thus, the fiscal consolidation improves the primary budget balance, directly reducing the amount of money that the government has to borrow and therefore the level of debt. Nevertheless, the reduction of public spending or the tax increase tends to have a negative impact upon the economic growth through fiscal multiplier, which could raise the government debt to GDP in the short term. The size of these effects depends on various factors highlighted in the literature. So, there are studies in which monetary policy can increase the size of the multiplier during a fiscal expansion (Spilimbergo et al., 2009) or studies showing how monetary policy interest rate close to zero may worsen the impact of fiscal consolidation (Woodford, 2011) or researches in which the results show that fiscal multipliers are higher in times of economic recession (Batini et al., 2012; Blanchard and Leigh, 2013). Any change will affect the budget deficit through automatic stabilizers, eroding a part of the fiscal effort that was made (Paraschiv and Ștefan, 2014). Together with the effects of fiscal multipliers, the fiscal consolidation could worsen the share of public debt to GDP in the short term considering that not only the starting level of debt is high, but also the size of the fiscal multipliers (Eyraud and Weber, 2013). As the public finance sector improves, the interest rate may decline and in this case the result is an improvement in the budget balance either as the government issues new bonds to finance the remaining deficit and the old debt is due date or because the existing debt was issued with floating rates. Lowering interest rates can have an impact on the economy too by encouraging investors and consumers to spend more, leading to an increase in GDP and resulting a decrease in the debt to GDP. Other factors can influence the dynamics of public debt, such as fiscal risks. For example, privatization procedures related to repayment of public debt can reduce debt costs, national currency depreciation can raise the debt burden held in foreign currency, the banking system recapitalization can increase the debt.

Therefore, in this article we intend to highlight the need to address public debt sustainability both in terms of deterministic

analysis that consider alternative scenarios not only in terms of interest rate shocks, exchange rate shocks, primary balance shocks, economic growth shocks, but also in terms of contingent liabilities shocks and through the stochastic analysis to better quantify the reactions of economic agents to changes in public debt, starting with the main fiscal burden indicators and continuing with the new approaches of public finance sustainability due to the highlighted need of using them during global economic pressures.

2. The main fiscal burden indicators

When the public debt evaluation is realised not only fiscal burden indicators must be considered, but also the access of a country to get finance. Thus, a classification of countries can be done, being divided in lower scrutiny and higher scrutiny.

Based on the approach of Carlo Cottarelli and Reza Moghadam (2011), an advanced country that has the current or projected share of debt to GDP higher than 60%, with a gross financing need (the amount needed to cover the budget deficit and the debt depreciation) to GDP bigger than 15% and has or is seeking exceptional access to IMF funds is in the case of higher scrutiny. According to the same approach, an emerging country that has the current or projected share of debt to GDP higher than 50%, with a gross financing need to GDP bigger than 10% and has or is seeking exceptional access to IMF funds is in the case of higher scrutiny.

Is recognized that debt sustainability problems can occur when there is a lower level than those established in the aforementioned approach, especially in the case of emerging countries. Therefore, additional indicators should be investigated to reveal vulnerabilities that may arise from large forecasts of fiscal adjustments, a high rollover debt risk, economic growth volatility, a high need for external financing, a large share of debt held by non-residents, a high share of foreign currency debt or a rapid increase in the short term debt.

In order to quantify the rollover debt risk, Escalano (2010) suggests examining the following indicators: the stock of public debt, current and projected primary balances and the difference between the projected nominal interest rate of debt and the projected nominal GDP growth rate. There is a whole debate regarding the indicator better measuring the debt. The preferred indicator should be, according to Emanuele Baldacci et al. (2011), the net debt as it considers both government assets and liabilities that could be used for debt repayment. However, the net debt measurement raises some

difficulties in many countries because of the differences on the definition of assets. Therefore, a comparable measure of gross debt is generally accepted. Current and projected primary balances are the key to fiscal policy consistency with the intertemporal budget constraint. The difference between the projected nominal interest rate applied to public debt and the projected nominal GDP growth rate affects the debt dynamics. The greater the differential between the interest rate and economic growth is, the more need is for a higher primary balance to ensure fiscal solvency.

The debt rollover risk may also increase if there are changes of the fiscal risks in the long run. The fiscal sustainability indicators computed by the European Commission must be taken into account, namely S1 (which shows the required increase of taxes or reduction of expenditure as a percentage of GDP in order to reach a debt level of 60% of GDP) and S2 (which shows the level of fiscal effort necessary to fulfil the intertemporal budget constraint on infinite time horizon) indicators.

Additional indicators used to assess debt sustainability should be according to IMF methodology (Backhache et al., 2013) the adjustment of the primary balance as a percentage of GDP cumulatively in three years, the variation coefficient of economic growth, external financing need as a percentage of GDP, the share of debt held by non-residents in total debt, the annual change in the share of short term debt to the original maturity and gross international reserves. Thus, an advanced country that has the primary balance adjustment as a percentage of GDP cumulatively in three years higher than 2%, the variation coefficient of economic growth higher than 1%, the external financing need as a percentage of GDP above 25%, the share of debt held by non-residents in total debt more than 45%, the annual change in the share of short term debt to the original maturity greater than 1.5 enters in the higher scrutiny country. An emerging country that has the primary balance adjustment as a percentage of GDP cumulatively in three years higher than 2%, the variation coefficient of economic growth higher than 1%, the external financing need as a percentage of GDP above 15%, the share of debt held by non-residents in total debt more than 45%, the share of foreign currency debt in total debt greater than 60%, the annual change in the share of short term debt to the original maturity greater than 1 enters in the higher scrutiny country.

It may also be the case that some countries with high fiscal burden indicators should be in the higher scrutiny classification, but

due to certain particularities such as holding highly liquid assets in a high amount to get to be part of lower scrutiny country.

The originality of debt sustainability assessment is that the analysis should not be interpreted in a rigid or mechanical way, the assessment must take into account the specific circumstances of the analysed country, involving probabilistic judgements about the trajectory of the debt and the availability of financing on favourable terms.

3. Fiscal risks (contingent liabilities) and stochastic analysis in the approach of public debt sustainability

With the worldwide deterioration of fiscal sustainability, the role of contingent liabilities has increased in debt sustainability analysis. Thus, governments can accumulate significant obligations in the form of contingent liabilities that are not recorded nor analysed in the fiscal documents, the contingent liabilities being actually some obligations triggered by an event that may or may not achieve. They can be defined either as potential liabilities that may arise from past events and whose existence will be confirmed only by showing or not one or more uncertain events not wholly within the control of government, or as a present obligation that arises from past events, but is not recognized because the level of obligation cannot be measured with sufficient confidence or it is unlikely to need some resources to settle the obligation (Brixi, 2004).

The high costs of transition and structural reforms have created the environment for the development of contingent liabilities at the government level. Moreover, both the SOEs' privatization due to fiscal constraints and the need to improve efficiency in infrastructure and pension system developed the use of government contingent support. The need to achieve a certain target on budget deficit generates incentives for governments in promoting measures that do not require immediate cash and at least for a while hide the true cost, creating long-term fiscal risks, complicating the structural reforms.

According to Brixi (2004), the fiscal risk matrix is as follows. Contingent liabilities can be explicit (government obligation created by law) or implicit (government "political" obligations that reflect some public or interest group pressures). Examples of explicit contingent liabilities may be state guarantees for enterprises loans, guarantees for financial institutions (state-owned banks, pension funds, infrastructure development funds), commercial guarantees, private investors guarantees, debt government guarantees. Implicit

contingent liabilities are claims of public sector entities for losses, arrears, guarantees and debts, claims of local government to cover liabilities and guarantees, financial institutions claims, non-contractual claims which may arise from private investment (such as infrastructure), other possible obligations (such as environment commitments for unknown damage and toxic and nuclear waste).

The real challenge lies in quantifying them. Therefore, the alternative scenarios method is used in debt sustainability analysis. There are also explicit and implicit direct liabilities (obligations in any event). This time, the explicit ones can be sovereign debt, future non-discretionary public spending (especially social security and health), transition costs of the on-going reforms, tax expenditures for exemptions. Direct implicit liabilities may be future recurrent costs of public investment projects.

In addition to the public finance sustainability approach in terms of contingent liabilities, different methods of stochastic analysis are increasingly emphasized in order to provide an extra to the public debt dynamic equation in the fiscal sustainability research in a manner as close to reality. Thus, Hasko (2010) uses a reduced form of VAR model, identifying a strong response of the public debt to economic growth, fiscal and monetary policies shocks. Escalano (2010) develops a practical guide to a better understanding of public debt dynamics, highlighting the complexity associated with the interaction between inflation, interest rate and fiscal adjustment. Using also a VAR model, but with debt feedback, Cherif and Hasanov (2012) test the effects of macroeconomic shocks on the public debt dynamics in the United States, showing that the optimal choice of optimal timing for a shock can improve the management and the public debt reduction.

Egert (2012) tests the relationship between public debt and economic growth, obtaining as a result a nonlinear relationship that varies by frequency data, timing and the characteristics of each country. Jawadi and Sousa (2013) analyse the public debt dynamics using multiple structural breaks. Greenlaw, Hamilton, Hooper and Mishkin (2013) test sovereign debt dynamics in advanced countries and conclude that countries with a high share of debt to GDP cannot be satisfied only with low interest rates because these countries are always vulnerable to adverse feedback loop, in which a high debt leads to higher interest rates and therefore, increasing the debt level and culminating in a critical point or a fiscal crisis where interest rates explode. So, the fiscal sustainability problem raises questions about the proper practice of monetary policy. Cevik, Dibooglu and Kutan

(2014) analyse the interaction between monetary and fiscal policy rules using Markow chains in emerging economies.

4. Conclusions

In conclusion, we have seen that economic turmoil manifested recently highlighted the interest of academics, central banks and policy makers for public finance sustainability. Thus, we realized the public debt dynamics analysis emphasizing the operating mechanism, deducting that monetary and fiscal policies decisions have effects on the public debt sustainability. The analysis has been enriched by a review of the main fiscal burden indicators deducting that the originality of debt sustainability assessment is that the analysis should not be interpreted in a rigid or mechanical way, the assessment must take into account the specific circumstances of the analysed country, involving probabilistic judgements about the trajectory of the debt and the availability of financing on favourable terms.

The research was further complemented with the new approaches of public finance sustainability due to the highlighted need of using them during global economic pressures, namely contingent liabilities and different methods of stochastic analysis used on this theme. We could see that the real challenge lies in quantifying these liabilities, therefore, the alternative scenarios method is used in debt sustainability analysis and we could review the most commonly stochastic analysis methods used to provide an extra to the public debt dynamic equation in the fiscal sustainability research in a manner as close to reality.

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CONNECTIONS BETWEEN FOREIGN DIRECT INVESTMENTS AND RESEARCH-DEVELOPMENT-INNOVATION ACTIVITY

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Abstract

Foreign direct investments represent one of the ways of financing any economy. But as any funding source, it has advantages and disadvantages for the host country. In this article, I begin by clarifying the concepts of direct foreign investments and research, development and innovation. Then, I intend to present, based on the analysis and synthesis of the economic literature, the positive and negative effects of foreign direct investments on the activity of research - development - innovation, highlighting, based on interpretations, the correlations among them. The analysis shows that the relationship between foreign direct investments and the research - development - innovation activity is complex and bidirectional. Another ideas developed in the article consist in the assessment of Romania's position regarding the research - development – innovation activity and in the presentation of the measures taken in Romania in order to reach the targets of the Europe 2020 strategy. Noting modest results in terms of research intensity in Romania, I suggest some measures aimed at stimulating research, development and innovation in our country.

Keywords: foreign investors, technology, competitiveness, economic development, interdependences, effects

JEL Clasification: F21, F23, O31, O32

1. Introduction

In the countries undergoing transition to the market economy, in the developing countries in general, the domestic capitals are not enough to support the processes of modernization, technologization and re-technologization, necessary for a country to follow a trend of sustainable development, and to adapt the production and

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technologies to the requirements of the participation to the international economic exchanges. One way of completing the internal sources of financing consist in using foreign direct investments. It is advisable, though, that the main source for investments in a economy to be domestic.

The article will clarify first the concepts of foreign direct investments, research, development, innovation. Starting from the economic literature, then the paper will show the positive and negative effects of foreign direct investments on the activity of research-development-innovation, as well as the interdependence between the foreign direct investments and the research-development-innovation activity. I shall use analytical methods, interpretations and correlations in order to draw conclusions on the research-development-innovation activity in Romania and I shall propose measures aiming to increase the level of the activity of research-development-innovation in Romania.

2. Conceptual clarifications regarding foreign direct investments and research, development and innovation

The research has as a starting point the definition of foreign direct investments given by the Balance of Payments Manual of the International Monetary Fund, the sixth edition (BPM6). According to it, ***foreign direct investments*** (FDI) represent a long-term investment relation between a resident of an economy and an enterprise resident in another economy. This relationship involves a high level of influence of the investor on the management of the enterprise in which it invests. In the category of foreign direct investments there are included the subscribed social capital and the reserves of a non-resident investor who owns more than 10% of the votes or of the subscribed social capital of a resident company, the credits between this investor or the group to which he belongs and the enterprise in which he has invested, as well as the reinvested profits. This definition shows the *essence of the foreign direct investments*, which presumes *that the investor has the power of decision and control on the investment objective*.

Research is an assembly of theoretical, methodic and systematic activities of obtaining, interpreting and processing controlled and verified scientific information (facts, events, behaviours or theories), of using it with the purpose of constructing comprehensive explanations regarding the essence of a particular domain of reality or of making practical applications using such facts, laws or theories.

The results of the research activity consist in new scientific or technological knowledge which can contribute to the economic development of the country, by improving the technological processes, the efficiency, quality and by diversifying the generated products and services, by increasing work productivity, etc.

The term of ***research-development*** (RD) covers three activities: fundamental research, applied research and experimental development.

The *fundamental research* consists of experimental and theoretical work done mainly in order to acquire new knowledge on the fundaments of the observable phenomena and facts without proposing a special application or utilization (Pisoschi A., Dobrescu E. M. (2006)).

The *applied research* targets a determined applied objective or purpose and consists of original work done in order to acquire new knowledge. This type of research allows transposing the ideas in an operational form (Pisoschi A., Dobrescu E. M. (2006)).

The *experimental development* consists in systematic work based on existing knowledge obtained through research and/or practical experience, with the purpose of launching the manufacturing of new materials, products or devices, of establishing new procedures, systems and services, or of improving considerably the existing ones (Pisoschi A., Dobrescu E. M. (2006)).

The research-development activity engenders both the transfer of technology created in another country (through foreign direct investments), and the development of in-house innovations.

The level of expenditure for research-development in a particular country is determined by the structure of its economy.

Innovation is an activity which starts from existing knowledge and which, on the basis of a creative process, improves or develops a product, a service, a technological process or the methods of company organization. In order to be considered innovation, the result must be significant in terms of the level of production, the quality of products or the costs of production and distribution.

Innovation brings added value to the initial element.

Innovation is one of the elements *sine qua non* for the economic growth and development, for the progress of a nation. Globally, knowledge is the decisive factor of the new knowledge-based economy – support for the increase of competitivity and for a sustainable economic development.

Innovation is one of the three vital factors of knowledge and competitiveness[1] (Iacovoiu, 2009), next to learning and partnership interactivity, because the endowment with (technical, scientific) knowledge is one of the determinant factors of the national competitive advantage in a particular economic activity (Iacovoiu, 2009).

The national scientific potential is important for the innovation process (Mowery, Rosenberg, 1979).

The capacity of the internal demand to express needs with anticipative character is a prerequisite of innovation.

3. Correlations between foreign direct investments and the research-development-innovation activity

Foreign direct investments are one of the ways of financing any economy. However, as any source of funding, it has both advantages and disadvantages for the host country. Starting from the observations according to which companies are those who make innovation and foreign direct investments are made also by companies, using data from the economic literature, the paper will present the positive and negative effects of foreign direct investments on the research-development-innovation activity and the connections between them.

The multinational companies must have a property advantage in order to go past the difficulties inherent to having activities in several countries. Innovation provides the technological knowledge that is the source of this property advantage. Since, in a way, innovation is a premise for foreign direct investments, innovation encourages foreign direct investments. However, it matters who produces the innovation. Thus, if a company benefits of intense processes of innovation, it will be stimulated to make more foreign direct investments. If innovation is also done by rival companies, then direct foreign investments can de deterred, because the innovation done by competitors implies the risk that the profit which pays for the innovation costs is reduced or even vanishes if the rivals have a successful innovation. In some industries, there is a company which benefits of significant advantages due to successful past innovations,

[1] *Thus, the index of competitiveness, according to the Lisbon strategy, is calculated in function of the data on the following pillars: basic requirements (institutions, infrastructure, macroeconomy, health care and educational services), factors for increasing the efficiency (higher education and human resources training, market efficiency, open-mindedness to the new technologies), factors of innovation (quality of the business environment and innovation).*

and it is very stimulated to continue its innovative processes. In other industries, there are more companies which innovate. Therefore, the relation between foreign direct investments and innovation depends on these aspects.

Starting from the premise of an existing property advantage for the multinational company, one may consider that the company making foreign direct investments is a big company. The big companies are much more innovative also because it is easier for them to get funds for investments in innovating activities. Griffith et al. (2006) show that the size of the company correlates positively with the innovation indicators of the company.

Terk et al. (2007) too, show that the big, foreign companies or the companies that are members of a large group have more innovating activities than other companies.

This idea is supported by Vahter (2010), who shows that there is a positive correlation between the inflows of foreign direct investments and the intensity of the technological transfer during the subsequent period, both from the company which makes the foreign direct investment, and from the suppliers. Also, the inflows of foreign direct investments decrease the probability that the transfer of technology is not used in the innovation process of the companies from the host country.

Lall (1983) shows that the transfer of new technologies, associated to foreign direct investments, may stimulate the research-development activity in the direction of implementing the new technologies and of adapting them to the local production processes.

On the other hand, benefiting of technology transfers from the mother company, the branches are no longer stimulated to do research-development activities.

The main channels through which foreign direct investments are linked to innovation are stimulants for research-development and resources availability.

Considering that competition is one of the most important determinants of innovation, we may say that foreign direct investment companies stimulate innovation, because their presence on a market enhances competition.

There are similarities between the effects of foreign direct investments and of innovation. Thus, both of them can generate the decrease of the costs (because of higher productivity of the production factors), the improvement of the quality of the products, the creation of jobs, the increase of the value of exports of goods and services, the penetration on new markets with the purpose to sell

goods and services, the change of the technical endowment, equipment and methods of work of the company. Innovation generates income from abroad through the sales of licences and patents, while foreign direct investments produce income in the host country as dividends and repatriated profit.

There are also more similarities between foreign direct investments and innovation. Thus, both have uncertain results, starting form significant initial costs. In the case of innovation, these costs refer to the efforts of developing different or higher quality products or to improve the production process or the organisation of the company. The initial costs of foreign direct investments involve the fixed costs of establishing new companies, the costs of adapting the technologies to the new economic environment, of finding local suppliers, of creating a distribution network, etc.

Both foreign direct investments and innovation must generate returns in terms of profits, which should cover the initial costs, otherwise the companies would not be stimulated to invest resources in these activities.

Both innovation and foreign direct investments are limited by the availability of the production factors, such as the skilled work force. The countries in which companies innovate should also have available resources for research-development and production.

The costs of innovation must be covered from the profits generated by the sales of products. Since foreign direct investments are made with the purpose to increase the profits, it seems that the opportunity to make foreign direct investments should accelerate the innovating process because of a higher return. However, the effects of the opportunities to make foreign direct investments on the innovating process are not significant when the new technologies are copied in the host country, because of the shorter period of time in which the foreign direct investment company benefits of higher profits due to its innovation.

It has been noticed that the opportunities to invest abroad (in response to the variations of the economic environment) stimulate innovation. For instance, when the offer of labour force increases in a particular country, foreign direct investments are made in that economy by transferring the production, and innovation increases, too (Glass and Saggi, 2002). Other changes, such as fewer difficulties in adapting the production technologies abroad, may support the increase of foreign direct investments and innovation.

When production moves abroad, generally, foreign direct investments generate spillover by demonstration, because the

process of production can be understood easier using locally a technology, than by the analysis of the end product. In the case of local production, the sources of information can be the workers of the foreign direct investment company who monitor directly the production process or who benefit of training (and who can either go to competitor companies or start their own companies), or the suppliers of the foreign direct investment company. These lead to imitations of the technology brought by the foreign direct investment company.

Vahter (2010) shows that the inflows of foreign direct investments produce, with some lag, positive spillovers on the process innovation in the host country. This is due both to the higher competition because of the inflows of foreign direct investments, and to the transfer of knowledge towards the host country. However, there is no significant positive correlation between the inflow of foreign direct investments, product innovation and organisational innovation.

A possible explanation of this different evolution might be that the knowledge which helps a company improve its production process may "spillover" from the foreign direct investment companies towards the resident companies easier than the knowledge on the product. The information which helps improving the production process can be used and combined with the local knowledge even in the companies which are very different from the foreign direct investment companies, obtaining different products.

The inflows of foreign direct investments don't stimulate cooperation between companies in order to obtain innovation in the transition countries, because multinational companies don't treat local companies as partners worthy of taking into consideration because of their lower experience and knowledge, and because they don't have intense innovation activities.

Acemoglu et al. (2006) and Aghion et al. (2009) show that an increase in the market share of the technologically advanced companies (multinationals) stimulates innovation of the companies from the host country if the resident companies are close enough to the technological frontier. There are positive effects on innovation of these companies with high productivity, because resident companies can avoid by innovation the adverse effects of competitors with better technologies.

However, if resident companies are far away from the technological frontier of that particular sector, the flow of foreign direct investments will reduce the stimuli for innovation of these companies,

because they have few chances to survive the tougher competition, which entails adverse effects on the increase of productivity.

Vahter (2010) shows that the effects of the inflows of foreign direct investments on the innovating activities of the residents don't depend on the distance at which the companies from the host country are from the technological frontier.

Bertschek (1995) and Blind and Jungmittag (2006) conclude that an increase in the market share of the foreign direct investment companies stimulates the tendency towards innovation of the companies from the same branch of activity.

On the other hand, Girma et al. (2009) have discovered a negative relationship between the presence of foreign direct investments in an industry and the innovation activities of the state companies in China.

There are studies which show that most companies prefer to do their research-development activities close to their headquarters (Howell 1984). This behaviour is explained by the long-term strategic importance of the research-development activities, and because the research-development activities are monitored by the company managers.

In the case of the companies overtaken by foreign investors and who don't have a continuous research-development activity, Stiebale and Reize (2008) sustain that foreign direct investment companies prefer to move the research-development activity of the overtaken company to their headquarters, or to reduce the research-development activity of the overtaken company. A decrease of the intensity of research-development activities[2], measured through the per capita research-development expenditure, has also been noticed.

Stiebale and Reize (2008) show that the foreign direct investment companies have a higher proportion of sales from innovations within the total volume of sales.

The same study has showen that both the inclination towards innovation, and the intensity of the research-development activity depend positively on the human capital, on the intensity of the physical capital and on the market power of the company. The companies which cooperate with public institutions or with other companies and the young companies are more innovative.

Foreign investors tend to invest in the companies with a high, unused potential for innovation.

[2] *The intensity of the research-development activity is calculated as the expenditure for research-development as a share of the GDP.*

The situation is different when companies with continuous research-development activity are taken over, in this case the intensity of the research-development activity remaining unchanged. Thus, foreign investors either move entirely these activities, or don't change them at all. This is because the continuous research generates a valuable stock of knowledge and a more efficient organization of the innovation process.

In the case of the new technologies, the companies prefer to make foreign direct investments to the detriment of granting licences, because of the high costs of transaction generated by the asymmetry of information. Thus, when a new technology is created, only the company which developed it knows all its features. The transfer of this technology to companies abroad by licence is difficult because the value of the technology is difficult to estimate.

Another reason why the companies which develop new technologies choose to make foreign direct investments to the detriment of granting new licences is of strategic nature. Thus, a company doesn't want to transfer its newest technologies to other companies which may become its competitors. A company which has received technology through licence, after it masters well the new technology, may close the licence contract and may start producing itself.

Another fear is that a company which uses a licence, uses that technology to invent another technology, which would make it an even more feared competitor.

Thus, both the perspective of the costs of transaction, and strategic considerations make companies transfer their newest technologies by foreign direct investments, and the older and less valuable technologies by granting licences (Glass and Saggi, 2002).

Competitiveness is strongly affected by the poor research-development capacity. Competitiveness is an essential condition in order to remain on a competitional market with both local and foreign partners.

Many times, foreign direct investments also entail specialised labour force. If these are researchers, innovative results are obtained. The foreign direct investment companies may bring in managerial knowledge, which may efficientize the management of the research-development-innovation (RDI) system, if the foreign direct investment companies are drawn into RDI partnerships.

All these show that the relationship between foreign direct investments and the activity of research-development-innovation is complex. The evidences showing that innovation boosts foreign direct

investments, while foreign direct investments stimulate innovations, do not always apply.

4. The activity of research-development-innovation in Romania

Research, development and innovation are key components of the European Union Strategy for economic growth, Europe 2020. Supporting the increase of work productivity, of the industrial competitiveness and of the efficiency of using the resources, and promoting new, innovative and green goods and services, this strategy supports smart and sustainable growth and responds to the challenges of the society.

According to Europe 2020 strategy, the research-development expenditures come from public or private funds. The public funds show the commitment of a government to promote directly and indirectly research-development-innovation (by effects on the private expenditure for research-development-innovation). The structural funds are an important source for public expenditure for research-development-innovation in many new European Union member states, among which Romania.

In the technologically advanced countries, the private financing of the research-development-innovation activity is the main component of the research-development-innovation expenditures and it is focused on several sectors (high tech, and high and medium technology processing, intensive cutting edge technology services). The proportion of the added value of these sectors within the total added value is an indicator of the research absorption capacity of an economy.

In 2012, Romania had the most catching up to do among all the European Union member states, in order to achieve the research-development intensity target[3] set for 2020. Romania has set a very ambitious target (2% of the GDP) for the intensity of research-development, if we consider both the present level and the previous evolution.

The evolutions observed in Romania regarding the accomplishment of the national Europe 2020 targets follow the general European Union trends. The investments in research-development-innovation have increased slightly and discontinuously, from 0.47% of the GDP in 2009, to 0.46% of the GDP in 2010, 0.50%

[3] *Intensity of the research-development refers to the proportion of research-development expenditures within the GDP.*

of the GDP in 2011 and to 0.49% of the GDP in 2012 (of which 0.30% of the GDP are public sources and 0.19% of the GDP are private sources)[4], however, below the average European Union rate of increase (about 0.05 p.p.). Romania is still far away from the national target for 2020, 2% of the GDP. The consolidation of the research, technological development and innovation is a priority of Romania for the 2014-2020 period, enabling it to achieve its national Europe 2020 target.

Three main types of indicators and eight dimensions of innovation are calculated for the European Union, amounting to a total of 25 different indicators gathered in the Scoreboard of Innovation Union (European Commission, Innovation Union Scoreboard (2014)).

The first type of indicators are the "favouring factors", which include the main vectors of performance in matters of innovation which are external to companies and cover 3 dimensions of innovation: "human resources", "opened, excellent and attractive research systems" and "financing and support" (European Commission, Innovation Union Scoreboard (2014)). These are the directions in which a country should act in order to enhance its innovation potential, since they form one of the pillars of innovation.

The second type of indicators, "activities of the companies", shows the efforts of innovation of the commercial companies, grouped in 3 dimensions of innovation: "investment of the companies", "entrepreneurial relations and spirit" and "Intellectual assets" (European Commission, Innovation Union Scoreboard (2014)).

The "achievements", the last type of indicators, include the effects of the innovation activities performed by the companies, being classified in two dimensions of innovation: "innovators" and "economic effects" (European Commission, Innovation Union Scoreboard (2014)).

The European Union member states are classified in four groups of performance on the basis of their average performance in matter of innovation. The first group includes the "leaders in innovation", whose innovating performances are much above the European Union average. The second group includes the "advocates of innovation", whose innovating performances are above or close to the European Union average. The following group consists of

[4] *Data from the National Program of Reform 2014, developed by the Government of Romania in April 2014, at Bucharest.*

"moderate innovators", whose innovating performances are below the European Union average, while the last group includes the "modest innovators", whose innovating performances are much below (less than 50% of) the European Union average. Romania belongs to this last group, being the most innovative among the countries of its group (50% of the European Union average in 2009 and 43% in 2013[5]).

The performance of Romania is much below the European Union average for almost all indicators. Ro has very poor performances for non-EU PhD students and research-development expenditure of the business sector.

Romania has similar performances with the European Union in terms of PhD graduates and exports of technology intensive services.

It can be seen that Romania classifies on a modest position in terms of innovation. This evolution is accounted for by several explanations[6]:

- Limited integration of the policies in the field on research, innovation and industry and insufficient cooperation between the institutions responsible with the development of policies and those responsible for their putting into practice.

- Poor quality of the scientific research and unclear and conflicting specifications regarding the intellectual property rights are deterring factors for the private investors.

- The low level and the diffuse character of the public financing, the lack of a multiannual framework of financing and the lack of coordination within the central administration undermine the efficacy of the public research system.

- There is no support for the newly established knowledge-based enterprises, for financing with the view to develop products or incentives for the cooperation between the big companies, innovating SMEs and universities.

In order to solve the flaws in the research-development-innovation activity and to connect Romania to the new European Union priorities of science and technology set by the Europe 2020 strategy, the Government of Romania has approved on 21 October 2014, the new National Strategy for Research, Development and Innovation, 2014-2020 (SN CDI 2020), developed by the Ministry of National Education. The document promotes the strategic role and

[5] *Data from EU Innovation Union Scoreboard, 2014*
[6] *Government of Romania (2014), National Program of Reform, 2014*

the priority position of the research as drive for the increase of the economic competitiveness,

This strategy is a *sine qua non* condition for obtaining European financing for the research-development-innovation activity in Romania. The strategy aims also to develop a favourable and attractive environment for the private investments in research, by financing applied research, and by public-private partnerships between research institutions, universities and economic entrepreneurs. In order to accomplish this objective, a change must take place in the structure and behaviour of the companies, so that they become true promoters of innovation on the basis of their own research-development efforts.

According to the delegate Ministry for Higher education, Scientific Research and Technological Development, Mihnea Costoiu "the National strategy for research-development-innovation 2014-2020 takes into account the results obtained during the past two decades of reform of the research and innovation, as well as the international trends which promote a science better interconnected and stronger oriented towards the applied impact of its outcome".

The National strategy for research-development-innovation 2014-2020 has identified the areas in which Romania can have significant contributions and by which it can benefit from the results of science and innovation to improve its competitiveness. The strategy aims the following three categories of priorities:

- *Priorities of intelligent specialization*, which presume the definition and consolidation of areas of high expertise in which there are real or potential competitive advantages, and which can contribute significantly to the increase of GDP. These areas can ensure, in their regional dimension too, competitiveness on the regional and/or global value added chains. The areas of intelligent specialization identified and promoted by SN CDI 2020 are the following: bioeconomy; information and communication technology; space and security; energy, environment and climate changes; eco-nano-technologies and advanced materials.

- *Priorities with public relevance*, which concern the investment of resources and creativity in areas in which research and development answer to special urgent and actual social needs. These priorities need the development of the capacity of the public sector to scan the space of new and emerging technologies and to ask innovative solutions from the public and private RDI operators. SN CDI 2020 supports the following priorities of public relevance: health, patrimony and cultural identity, new and emerging technologies.

- The *fundamental research* remains prioritary within the strategy launched by the Ministry of National Education. While the previous priority areas aim to acquire a higher relevance and impact of the research-development-innovation activities for the competitive development of the economic environment and to improve the quality of the social life, the fundamental research stimulates the investigation of frontier areas of the scientific knowledge. This includes both the basic sciences (mathematics, physics, chemistry, life, nature and engineering sciences), as well as humanistic and socio-economic disciplines, aiming to reach an international level of quality and visibility of the scientific production.

We can see that in the priority areas a particular importance is granted to innovation, this activity being the essential condition for the achievement of the proposed targets, because almost all the components of the National RDI strategy of Romania for the period 2014-2020 aim areas of high technological level that require a high level of innovation.

The strategy also supports the financing of the existing or developing clusters, particularly in the areas of intelligent specialization and of emerging technologies, with a major impact for the sustainable increase of the economic competitiveness.

The main directions of action in the field of research-development-innovation reflect the continuation of the objectives for the period 2007-2013 and aim, on the one hand, at strengthening the relationship between research and enterprises by the priority promotion of the RDI activities in the economic sectors with growth potential and public relevance (support for the development of RDI activities in the private sector; human resources development for RDI and training the researchers and engineers in matters of industrial rights and intellectual property) and, on the other hand, at improving the administrative capacity of the national RDI system to increase the efficiency of the investments in this field, encouraging the transfer of knowledge, technology and staff with advanced RDI competencies, with the view to innovate processes and products in the areas of intelligent specialization (Government of Romania, National Program of Reform, 2014). Furthermore, Romania supports the internationalization of the Romanian research and considers attracting staff with advanced competencies from abroad in order to consolidate the Romanian capacity for research and a better integration within the European Research Area.

Foreign direct investment companies can be attracted in order to support the research-development-innovation activities in

Romania, particularly in the areas of intelligent specialization (which have a fast potential for development) and in high-tech areas. Thus, their expertise and the technological transfer can be beneficial.

Below, we present the achievements in the field of RDI obtained so far in our country.

In order to stimulate the private investments in RDI and to consolidate the industrial basis, two capital investments (over 30%) have been done, within the JEREMIE initiative, in the development of two SMEs innovative in technology of information and communication as well as mobile phones. Also, 39 integrated innovative projects (out of which 14 are RDI) have been contracted, initiated by the managers of five poles of competitiveness, for the innovation of products and technologies in auto industry, robotics and furniture; for the development of value chains, the technical-financial evaluation of the innovative projects proposed by 27 clusters has been finalised.

Furthermore, by March 2014, in order to stimulate private investments in RDI, 141 innovative public-private partnership projects, start-ups and spinoffs have been finalized, whose purpose has been to apply innovative products, processes and technologies in enterprises; this resulted in 112 patent applications, 57 research-development results transferred and implemented in enterprises and 730 new jobs created. The volume of the private funds drawn in RDI amount to about 330 million Euro. Also, 141 projects have been contracted for the support of partnerships between universities-research institutes and enterprises and for the support of innovative enterprises; new calls for projects have been launched for the programs Partnerships and Innovation within PNCDI II (Government of Romania, National Program of Reform, 2014).

Some cooperation initiatives between the public and private sectors, associated to the development of clusters, managed to bring together the decision factors, the public research institutions, large companies and SMEs. The implementation of properly directed measures of assistance would have a decisive role in further supporting the development of these initiatives. The increase, in 2013, of the fiscal deductibility of the research-development investments from 20% to 50% and the draft of law regarding innovation of the employees, which has been sent to the Parliament, are welcomed efforts aiming to support the private investments in research and innovation in Romania.

The development of RDI activities within the enterprises had been supported through PNCDI II and FEDR, by financing over 1200 projects supporting the private RDI investments.

Of a particular interest for the business environment, for the improvement of RDI system performance and for the direction of the public funds towards performing scientific and technological areas, has been the process of evaluation, classification and certification of the 46 national research and development institutes.

The on-going evaluation of the research institutes has led to improvements of the medium-term institutional strategies, but there still lacks a comprehensive approach which should allow a concentration of the institutional resources.

Measures are implemented aiming to develop the human resources and the material basis for research, which contribute both to the improvement of the national RDI performance and to the accomplishment of the European Research Area by post-doc and exploratory research projects and by the establishment of young independent research teams and infrastructure projects.

Romania has done limited progress regarding the recommendation for a higher synergy between research, innovation and enterprises, particularly by giving higher priority to the research-development activities which have the potential to draw private investments.

Following, there are some measures aiming to support a higher level of research-development-innovation activities in Romania:

1. The implementation of a mix of policies and instruments which should correlate the research-development objectives with those of the industry, education, employment, fiscal and investment policies.

2. Granting fiscal stimulants to the private sector with the purpose to increase its contribution to research-development financing.

3. Establishment of public-private partnerships in industrial research.

4. Cooperation between research centres and industry.

Furthermore, it is necessary to focus on those research-development priority areas which can support the economic growth by financing the applied research projects; by improving the efficiency of RDI management and financing; by achieving the transfer of research-development outcomes into the applied, production sector.

5. Conclusions

The purpose of the research-development-innovation activity is to produce new scientific or technological knowledge which can

contribute to the economic development of the country, to the progress of a nation, by improving the technological processes and the efficiency, the quality and diversity of the products and services, by increasing work productivity, so that this activity supports the national interest.

The analysis shows that there is a complex, two-way relationship between foreign direct investments and the activity of research-development-innovation. Thus, there are situations when the activity of research-development-innovation supports the accomplishment of foreign direct investments, but this positive correlation depends on several premises. Foreign direct investments can stimulate the research-development-innovation activity in the host country, but they can also hinder it depending on the existing circumstances.

Considering that Romania has been classified among the modest innovators (EU scoring according to the results obtained by Romania in the research-development-innovation activity), the consolidation of research, technological development and innovation is a priority for Romania in the period 2014-2020, with the purpose to accomplish the national target by 2020. This direction of action is explained by the fact that the research-development-innovation activity is a drive for the increase of the economic competitiveness of Romania, being thus a factor which promotes the national interest.

Among the measures intended to support the increase of the intensity of the research-development-innovation activity in Romania, the implementation of a mix of policies and instruments which should correlate the research-development objectives with those of the industry, education, employment, fiscal and investment policies, the measures stimulating the involvement of the private sector in the research-development-innovation activity, as well as those concerning the dissemination of the results are of great importance.

It is in the national interest of Romania to have an *intelligent specialization* in areas of high competency where there are real or potential comparative advantages, and which can contribute significantly to the increase of the GDP, as stipulated in the National Strategy of Research, Development and Innovation, 2014-2020.

We have noticed that in the priority areas a great importance is attached to innovation, this activity being the essential condition for the accomplishment of the proposed targets, since almost all the components of the National Strategy of Research, Development and Innovation, 2014-2020 of Romania target high-tech areas which require a high level of innovation.

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