

Financial, Public and Regional Economics**The Degree of Autonomy of the Romanian Local Public Expenditures****Maria Letitia Andronic (Bratulescu)¹**

Abstract: The process of local public spending optimization is extensively studied by those who have the power of decision towards saving. Even if the goal is to adjust the imbalance revenues/expenditures, the trend to spend more than accumulated is still a matter of concern. Our objective is that of analyzing the local governments' functional expenditures by measuring the degree of decentralization/autonomy. The value of the paper is given by the model we applied for Romania which is based on spending management. By analyzing different types of expenses, we have highlighted that local expenditures represent instruments of strengthening or weakening local autonomy. The indicators measure the effectiveness of local expenditures by using the model published by The World Bank in 2006. We gathered information through interviewing different Town-Hall representatives from Brasov County and then we gave scores and established ranks. As the degree of autonomy reached a score of about 3 on a scale of 1-4, we identified that the class in which Romania is placed (B) is mostly defined in terms of delegated powers and not decentralized competences. The study is significant for politicians, for those responsible for implementing decentralization, but also for the taxpayers who deserve the best public services.

Keywords: decentralization; local public services; local performance; local budget

JEL Classification: H72; H76

1 Introduction

Throughout the communist period, the freedom of the Romanian municipal councils in the decisions regarding spending was limited. Expenditure plans were subject to prior approval by the central planning authorities. For many years, the system remained strongly centralized and a great majority of expenditures were rigidly controlled by the central Government. Therefore, bringing expenditure decisions closer to citizens became one of the major objectives of fiscal decentralization in Romania after 1990.

Unlike the private sector, where expenditures rarely exceed revenues and expenses are minimized every year, even if there is an inappropriate management practice, in

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the public sector, the level of these expenses does not decrease, nor maintained at the same level, but increases steadily.

Although this topic is being attacked from all directions, the results are about the same. Expenses maintain top position in the state budget, regardless the size of the revenues. Although various studies concerning the budgetary balance, the tax policy or the optimal construction of tax systems were conducted by different economists, questions regarding the causes of the unjustified continuous expenditure growth or the identification of realistic and consistent measures by which to overcome these impasses are still frequent.

Generally speaking, the authorities wanted firstly to find ways to increase revenues, reduce arrears, provide financial resources to the budget and only secondly to reduce budget expenses. This is somehow justified as it is known that expenses are the engine of the economy: people spend, the industry produces goods and services and the circle continues amplifying.

According to the Local public finance law, establishing the level of the public expenditures by the local public administration involves not only good knowledge and an appropriate prioritization of the destinations and beneficiaries of these resources, but it also acquires their real capacity to perform certain expenses. However, the distribution of their own or transferred resources must be made according to the actual needs of that specific local government in order to avoid waste and ensure the efficiency, the effectiveness and the economy in the use of public money (Local public finance law no. 273/2006, chapter I, article 5, paragraphs 3 and 4).

State system is a closed one, almost counterproductive in terms of the net direct profit. Health, education, defense, public order and social assistance are considered to be unproductive sectors. In fact, this is an error as these sectors produce and provide skilled labor, maintain health, offer protection to the members of the society (from a socially point of view) so that they can participate afterwards in the economic activity. However, to ensure all these, budgetary resources are necessary. Measuring the expenditures' degree of autonomy can be achieved through several qualitative indicators that show the level of government responsible for spending the necessary financial resources in order to provide a particular service. Defining and measuring competence shared at local, regional and national level in the case of public services, such as education, requires a more rigorous study. Exclusive competences are those that reflect the highest degree of autonomy and, also call the attention of local authorities because they are solely responsible for the quality of public service provision and for the cost of providing it (Roman & Mosteanu, 2011, pp. 168-169).

To reflect the spending degree of autonomy, one of the most complex models was developed by Bell, Ebel, Kaiser and Rojchaichainthorn (The World Bank, 2006). What we want to emphasize in this paper is the degree of autonomy and fiscal

decentralization concerning sub-national government expenditure by using this model in the case of Romania. We have also gone deep into the problem of local spending by presenting the evolution of the Romanian local public expenditures according to the functional classification.

2. Stage Research and Research Methodology

Considering that the relationship between local autonomy and decentralization may lead to guarantee the stability of a functioning democracy, we came to the conclusion that it does not present a unified approach in the specific literature, aspect which creates practical difficulties in defining it.

We noticed that many papers which study the quality of the financial decisions taken at local level belong to the local public finance and the management of local public sphere. This occurs because, on the one hand, the financial decisions are the expression of the financial policies pursued by central or local public authorities and, on the other hand, the aspects regarding such decisions concern the public management field. In the area of public financial management, the local part became an important matter of concern especially in the context of decentralization. As a result, there are at least two strategic objectives:

- 1) providing citizens a balanced and sustainable local delivery of public goods and services
- 2) an increase of local government's financial solvency in order to ensure an optimal, balanced and sustainable development.

Undoubtedly, the administration of the two strategic objectives depends on the quality of local financial decisions (Onofrei & Tudose, 2011).

For a correct measurement of the expenditure autonomy, we should be able to identify and, more importantly, to quantify all those direct and indirect constraints that actually reduce the room for maneuvers of a given authority on the expenditure side of the budget. However, it is not even possible to give an exact measure of the direct legal constraints, let alone the rest. Identifying the purely local expenditure functions and the related actual outlays is a relatively simple exercise. The most common estimations of this kind of autonomy have been presented by many authors using different perspectives (Marcou, 1999; Dafflon & Perritaz, 2000; Brueckner, 2000 and 2001; Beer-Tóth, 2009).

However, as it is presented in the study published in 2009 by the last author mentioned, the dominant model used in measuring local financial autonomy compares the volume of local expenditures to general government expenditures or, alternatively, to the GDP. These simple indicators represent a starting point for the design of fiscal decentralization measures. Nearly all studies used the indicators

offered by the Government Finance Statistics of the International Monetary Fund. Even though scholars have long identified their apparent weaknesses (Ebel & Yilmaz, 2002; Meloche *et al.*, 2004), these indicators are still in use (The World Bank database, 2007). Some authors underlined, on the expenditure side, the failure of the Government Finance Statistics to distinguish between mandated and optional expenditures of local governments. The outlays related to mandatory functions appear under local expenditures, even though the decentralized government units have limited or no authority over these functions. Moreover, in addition to direct functional expenditures, the data used by this institute also include monetary transfers flowing from the local level to higher levels of government (Beer-Tóth, 2009, p. 97). Anyway, these indicators show which level of government is responsible for which expenditure functions.

Firstly, our research paper analyzes a more sophisticated typology for describing the role of local governments in service provision than the ones presented before by the authors mentioned. As we emphasized in the introduction, this idea belongs to four economists that in 2006 published their results in a study for The World Bank (Bell *et al.*, 2006). Thanks to the clear description of the content of sub-national autonomy in each of the six dimensions of service provision that they introduced, this model is better suited to practical implementation. In this part of the research, we used the score and the assigning ranks methods. Literature reveals that such an analysis for Romania was also developed by another author (Cigu, 2011).

Secondly, the article aims to point out some results related to the local expenditures in Romania taking into account the overall values and also the values according to the functional classification. The analysis that we present has the following structure: specification of the indicators for the achievement analysis, identification of the right methodology to establish the values of the indicators, calculation of the value and interpretation of results, identification of influence and diagnosis. The main resources used for our analysis are the income and expenditure local budgets for 2000-2013. We focused on the expenditure part of the budget, as our study deals with indicators concerning the efficiency of local public expenditure. We took into account the budget implementation, i.e. the budget execution accounts. We obtained the necessary information for the case study regarding Romania mostly from the Romanian National Institute of Statistics. We used information regarding the public services provision and the degree of autonomy from representatives of Sacele and Brasov Town Halls.

3. The Analysis of the Factors that Influence the Degree of Autonomy and Decentralization

As we mentioned in the first part of the paper work, one important issue that we studied in this paper is the degree of autonomy and fiscal decentralization recorded in Romania lately. According to the study from The World Bank in 2006, the four authors established six factors which influence the degree of autonomy in terms of providing local public services. Each factor receives a score of 1 to 4 to the various degrees of local expenditure autonomy: exclusive competence of central authority (D=1), delegation of competence to the local authority (C=2, B=3) and full competence of sub-national authority (A=4). Therefore, each local public service is provided locally or not. Its classification in one of the four classes depends on the six dimensions of provision and on the score given. Estimating the degree of local autonomy involves obtaining a mean score between 1 (no autonomy) and 4 (full autonomy).

The first three factors taken into account are related to the funding process, to the public employees and the legal framework. The factors have the following features:

- I.** Local funding of public service - which level of government sets the main policy guidelines for the provision of a public service
- II.** Local public officials - which level of government has control over the payroll and the decisions with respect to hiring, promotion or firing civil servants
- III.** Standards setting and regulation, the legal framework - which authority sets quality standards for the composition of local public services and the regulations that may accompany sub-national government spending programs

In the following table we have the main features of each of these factors according to the four classes described before.

Table 1. A typology of expenditure autonomy – factors I, II and III

Factors of influence	Full local autonomy (A = 4)	High level of local autonomy under central authority supervision (B = 3)	Reduced level of local autonomy under central authority control (C = 2)	Central authorities fully control and no local autonomy (D = 1)
I	The policy, the budget and the assignment of functions are set by the local government.	The local authorities control their own budget process and execution with guidance from central government.	Central authority sets policy and budget; the local one has some ability over decision-making.	Local authority is delegated to execute the work which was fully planned by the central.
II	The civil servants are controlled by the local governments.	Civil servants are controlled by the local level. Central government supports the local one in areas with no expertise.	Central authorities control the civil servants. Local government has some ability over decision-making.	Central level determines the civil servant's salaries and the conditions of employment.
III	Local authority sets the standards of all public services which are consistent with the state law.	Local government sets some standards, of public services under the central government's supervision and influence.	Central authorities set standards and regulations. Local ones may adjust the standards to local circumstances.	Central administration sets standards, regulations and compositions of public services.

Source: Bell et al., 2006

The other three factors of influence mostly concern the administration, the production and the delivery evaluation of the local public services offered to the local communities. They are described as follows:

- IV.** Local public service administration - service delivery on a day to day basis
- V.** Local public service production - which authority has control over the service opportunity and priority, ensuring the proper quality, as well as delivery in a timely manner
- VI.** Monitoring and evaluation of public service delivery - which authority is responsible for the evaluation of local government performance.

The typology of the last three factors according to the classes A to D is presented in the table below.

Table 2. A typology of expenditure autonomy – factors IV, V and VI

Factors of influence	Full local autonomy (A = 4)	High level of local autonomy under central authority supervision (B = 3)	Reduced level of local autonomy under central authority control (C = 2)	Central authorities fully control and no local autonomy (D = 1)
IV	Local authority determines its own structures in order to adapt them to local needs.	Local governments determine their administrative structures with guidance from central government.	Central authority sets administrative structures while local ones may adjust the services to local needs.	Central administration mandates internal administrative organization.
V	Local authority fully controls the standard of the public service, ensure quality and timely delivery.	Local governments ensure quality and timely delivery according to local needs under central government's guidance.	Central authority has the entire control. The local one has the ability to adapt the services to the needs.	Central administration controls the standard of the service and ensures quality and timely delivery.
VI	Local administration has full control for future improvements.	Local administration has the control, but the outcomes are reported to the central government.	Central authority has all the control. Local government participates in some aspects.	Central government fully monitors and evaluates the local performance.

Source: Bell et al., 2006

The main idea is to study each public service sector and sub-sector individually along the six dimensions of service provision and to evaluate local autonomy in each of these dimensions by means of the scores 4 to 1. The score of a certain sector will be established as an average score of all the sub-sectors included in it. The final step would be to develop a weighting of the various sectors in order to provide a final score of the sub-national autonomy of a certain country or group of countries. For instance, in the case of Romania, a municipality might have full control over recreational activities, but a negligible influence on basic health care. So, we should analyze the autonomy degree of the most important public services offered to citizens in a country such as Romania.

We applied the model proposed by these four economists in Romania:

Table 3. The expenditure measure of autonomy degree in Romania

Public service	I	II	III	IV	V	VI	Autonomy degree
Public authorities	2.67	2.67	2.67	2.67	2.67	2.67	2.67
Foreign relations, nat.defense	1	1	1	1	1	1	1.00
Local police	4	4	4	4	4	4	4.00
Public order and fire fighting	3	3	3	3	3	3	3.00
Education	2.50	2.50	2.00	2.00	2.00	2.00	2.17
Primary and secondary school	3	3	2	2	2	2	2.33
Higher education	2	2	2	2	2	2	2.00
Health	2.33	3.00	2.00	3.00	3.00	2.00	2.56
Basic health care	2	3	2	3	3	2	2.50
Health protection,public health	2	3	2	3	3	2	2.50
Hospitals	3	3	2	3	3	2	2.67
Culture and sport	3.50	3.50	3.00	4.00	4.00	3.50	3.58
Theaters, museums, libraries	3	3	2	4	4	3	3.17
Parks and recreation	4	4	4	4	4	4	4.00
Social care	4.00	3.00	2.00	4.00	4.00	3.00	3.33
Nursery and homes for elderly	4	3	2	4	4	3	3.33
Services to the elderly, to the persons with disabilities	4	3	2	4	4	3	3.33
Special social services	4	3	2	4	4	3	3.33
Unemployed	4	3	2	4	4	3	3.33
Public utilities	4.00	4.00	3.00	3.67	3.67	4.00	3.72
Running water, sewage system	4	4	3	4	4	4	3.83
Electricity	4	4	3	3	3	4	3.50
Fuel and heating systems	4	4	3	4	4	4	3.83
Environmental protection	3.25	2.75	2.50	3.25	3.25	2.75	2.96
Waste collection and storage	4	4	3	4	4	4	3.83
Street cleansing	4	4	3	4	4	4	3.83
Environmental protection	3	2	3	3	3	2	2.67
Natural disasters	2	1	1	2	2	1	1.50
Public transport	3.50	3.50	3.00	3.50	3.50	3.00	3.33
Roads	3	3	3	3	3	2	2.83
Public transport and lighting	4	4	3	4	4	4	3.83
Urban development	3.00	2.00	2.67	3.33	3.33	2.33	2.78
Urban planning, development	4	2	3	4	4	4	3.50
Regional planning	2	2	2	2	2	1	1.83
Tourism	3	2	3	4	4	2	3.00
Average autonomy degree	3.19	2.99	2.54	3.27	3.27	2.81	3.01

Source: The author, based upon data received from Brasov and Sacele Town Hall and specific legislation

According to this analysis, the degree of autonomy of sub-national government expenditure is about 3, a score which places Romania in class B. The highest score is obtained in the case of service delivery administration and production (3.27). As a result of the implementation of local autonomy in a unitary state in which local authorities competences are set by the national legislation, the influence factor reflecting standards setting and regulation is the lowest (2.54).

The framework law on decentralization regarding the provision of public services underlines that local government authorities are required to meet quality standards (the decentralization framework law no. 195/2006, article 7). This is particularly evident when the correlation between the decentralization process of local public services and local financial resources is not a matter of concern. Whereas in services, central authorities tend to transfer more responsibilities, in the resources area, there is no clear strategy of decentralization.

Up to this date, the approach proposed by Bell *et al.* (2006) has certainly been the most powerful one for measuring sub-national expenditure autonomy. Nevertheless, at least two points deserve some further reflection:

1. The reason about whether local government units in a given decentralized system have a “high degree” or just “some degree” of autonomy (i.e. the choice between score 2 or 3) is highly subjective. Within “civil service” for instance, control over wages and working conditions appears as a key component of autonomy. In reality, the actual labor market conditions may limit the degree of control both for the central government and the sub-national governments (Beer-Toth, 2009, p. 104).
2. The level of aggregation of the public expenditure categories as proposed in table 3 allows hardly anything more than a few generalized observations about sub-national autonomy. In order to obtain more reliable information, every category has to be broken down into a set of subcategories. In the case of primary or secondary education, these could be represented by teacher’s qualifications, wages and employment conditions, educational programs, school organizations, buildings and equipment etc. (Dafflon, 2006, p. 296).

There are still major economic and social objectives of national and strategic interest like national defense, public order, foreign relations, citizen and environment protection or macro-social policies of stability and welfare which are kept by the central government. They are being financed by the central government because their impact affects all citizens of a country. However, in the past few years, the area of expenditure financed from local budget has grown in Romania. As we saw in the previous table, some public services financed by the central government moved to local financing. It is the case of some public utilities like road construction, police activity, schools, local transport, municipal services etc.

For instance, during 1999-2000, financial decentralization took place in the case of several activities such as subsidies to thermal energy delivered to the population, financing the agricultural consulting centers, the plant protection or the veterinary activities. The decentralization of public services has continued to support the primary and secondary education system by taking over the process of financing civil service (especially wages), as well as financing nurseries. Nevertheless, new units of culture and religion and domestic heating aid for individuals were transferred to the local government administration. In 2003, we recorded the transfer to local authorities of the expenditures regarding the rights of persons with disabilities, the population computer record service and the community police activity.

Table 4. The evolution and structure of sub-national government expenditure (SNGE) in Romania according to the functional classification in 2000-2013

Year	SNGE	General public services	Social-cultural expenditure	Services and public development, dwellings, environment and waters	Different economic actions	Other expenditures
million lei current prices						
2000	3321.7	478.3	802.4	1196.4	398.8	445.8
2001	7067.5	686.3	3503.8	1797.9	601.0	478.5
2002	9268.8	893.5	5002.4	2079.0	710.9	583.0
2003	12852.7	1203.0	6774.7	3334.0	1044.9	496.1
2004	15540.7	1488.8	8256.8	3156.3	2203.7	435.1
2005	18777.0	1908.7	9971.8	3673.4	2766.3	456.8
2006	25392.8	3045.7	13574.7	2999.7	5535.5	237.2
2007	33982.3	4257.6	17847.9	3778.4	7712.6	385.8
2008	42210.2	5668.9	22272.3	4815.4	8844.6	609.0
2009	42074.5	5821.5	22519.9	5357.1	7720.2	655.8
2010	41207.1	5235.0	21191.5	5533.0	8714.1	533.5
2011	44003.8	5180.6	20356.0	7372.8	10608.7	485.7
2012	46333.4	5561.8	21586.1	7715.8	10916.6	554.1
2013	47380.4	5825.8	22999.8	7340.8	10562.3	651.7

Source: *Statistic Yearbook of Romania, Local budget execution on expenditures 2000 - 2013*

Based on the data offered by the *Statistic Yearbook of Romania*, an analysis of expenses, according to the functional classification for the 2000-2013 period of time, highlights the following aspects:

- in 2000, the expenditures group represented by services, public development, dwellings, environment and waters had the largest share among local public expenditure (36.02%);

- since 2001, Romania recorded an increasing share in the local budgets of social and cultural expenditure, in particular for education (in 2001 the category of social and cultural expenditure doubled as compared to 2000, 49.58% vs. 24.16%);
- in the following years, the social-cultural expenditures remained at relatively high values, with an average of about 51.50%, due to the extremely high growth recorded in the expenses for education supported by the sub-national government;
- it is expected a substantial rebound regarding the finance from the local budget of the health system, especially since the services offered by hospitals were decentralized in 2010;
- the assistance and social protection subgroup had a sinuous evolution, with a trend to increase its share in the local budget expenditure;
- over the analyzed years, the sub-national government expenditure reveals the existence of a general ascending trend in current prices, with no big fluctuations, due to the enlargement of the local financing and subordination of the expenditure area.

The evolution of the main categories of local government expenditure can be highlighted also in figure 1.

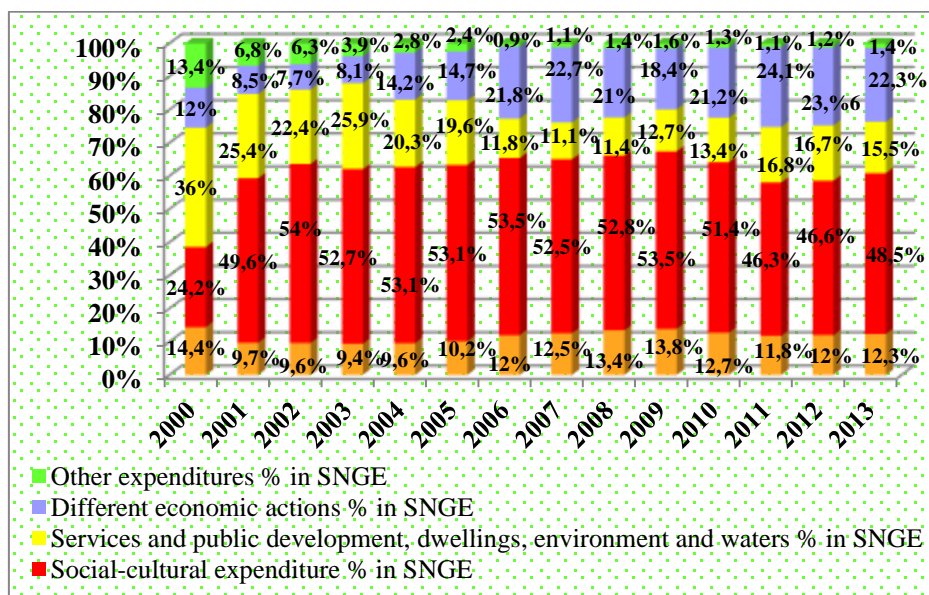


Figure 1. The evolution of the main categories of local public expenditures as percentage in SNGE for 2000-2013

General public services expenditure recorded a quite constant evolution during the 14 years analyzed (at about 11.67%), in contrast with the other evolutions presented in the figure. In 2000, general public services had the highest share in total expenditure (14.40%); during the next years the indicator decreased, so that, in 2003, the weight was of only 9.36%. Between 2004 and 2009, the weight increased from 9.58% in 2004 to 13.43% in 2008 and 13.84% in 2009, while in the last four years of analysis, the indicator went under 13%.

We notice an upward trend both for the social and cultural expenditure, but also for the economic actions. The social-cultural expenses represented 802.4 million lei in 2000 and their weight in the local public expenditures grew from 24.16% to 48.54% in 2013 (all most 23,000 million lei). In the case of the economic actions developed, the indicator increased from 12% (398.8 million lei) in 2000 to 24.11% (10,608.7 million lei) in 2011. However, for the latter category mentioned, in 2001, 2002 and 2003, the percentage dropped to 8.50%, 7.67% and 8.13% respectively. The same remark can be made for the last two years of analysis, but also for 2008 or 2009, when these types of expenditure decreased to a level of 20.95% in 2008 or 18.35% in the next year.

Public development, services, dwellings, environment and waters expenditure recorded an important evolution, even if the general trend was a downward one. At the beginning of the time period, the share was very high (about 36%). For the 2001-2004 period of time, the average level decreased to 23.53%; starting with 2005, a drastic reduction occurred, so that in 2007 their weight in the local budget was of only 11.12%.

4. Conclusions

Local autonomy is the most effective and efficient framework that can influence development by combining coherent strategies and resources to local policies, possibilities and needs. Institutional decentralization also implies fiscal decentralization, thereby ensuring the creation and strengthening of local autonomy, as well as the rationalization of fiscal relations between central and local authorities in order to create a balance between the responsibilities of local administration and the financial and material resources available to them. The system used for collecting the needed resources for the local authorities must be sufficient and diversified to enable them to follow and measure the real cost of exercising the powers and competences they hold.

As we saw in the literature review, measuring the financial side of local autonomy has been the subject of many researchers as a result of the process of measuring the relationship between decentralization and macroeconomic variables. Many of the indicators have been revised over time and sometimes were the basis for building

other indicators. So far, an indicator to cover all the components of autonomy was not yet identified.

As we expected, the study of fiscal decentralization in Romania and its impact on the financial autonomy of local governments resulted in several findings. Local autonomy, the extent of which is determined by the division of expenditure powers among the various levels of government, is ideally subordinated to equity, efficiency and stability. Following this line of argumentation, local authorities should desire neither more nor less autonomy than what is necessary for ensuring that the general government system fulfills its economic role. In this context, autonomy is not the final objective, but an instrument that allows the achievement of other objectives. Nevertheless, the optimum degree of decentralization (or autonomy) cannot be determined by using only objective criteria, aspect which leads to some divergent conclusions of those who approached the autonomy and decentralization areas.

Lack of sufficient financial resources determines the impossibility for a part of the goods and services that should be provided from the local level to be covered. The power of financing such goods and services depends on the level of economic and social development of each locality. First of all, the more developed an administrative unit is, the more varied and complex are the services expected to be offered to the inhabitants. Secondly, a municipality or a county with higher degree of collection can support better the cost of goods and services. Moreover, it can even better control the efficiency of supply.

The result obtained from measuring the expenditures' degree of autonomy in Romania established by using Bell, Ebel, Kaiser and Rojchaichainthorn's model points out that the autonomy of public services is placed within class B, close to class C. Reaching a score of autonomy of 3.01 may be defined by the existence of more delegated competencies than decentralized competencies regarding especially the legal framework (2.54), the monitoring and the evaluation of public service delivery (2.81) and the local public officials (2.99).

Romania's experience reveals a higher consensus in the political environment on the transfer of responsibility for expenditure than on the level and degree of autonomy regarding revenues. In this context, local governments would likely provide public services of a low quality, eroding citizens' trust in local authorities in the process of the administrative reform.

In most of the administrative-territorial units of Romania, budgeting was not preceded by a pertinent inventory of the whole taxable mass. In addition, nobody paid the proper attention to tracing and identification of all the available own revenues. All these brought about an excess of expenses by predicting the achievement of additional revenues in the form of allocations and subsidies from the central government. This has also resulted in failures regarding payments due to lack of funding.

On short and medium term, we propose the implementation of adequate, flexible and modern economic and financial mechanisms to encourage local performance. Currently, although local governments have potential, it is not fully used as the self-financing level is relatively low. Long-term strategic goal will be the continuous economic and social development of local communities in order to ensure government resources comparable to their responsibilities.

All in all, together with the functional classification of public expenditures, the indicators and methods of local autonomy measurement presented in this article provide a multi-dimensional matrix that also allows cross-country comparisons. We consider that such comparisons should be applied in further studies. The local financial indicators analyzed throughout this research paper can be combined with some other non-financial indicators that characterize local administration, in order to provide a much more complex diagnosis. For instance, future articles might refer to the role and implications of the region, as level of local government in Romania, upon strengthening local autonomy. Besides the theoretical part, the study of regions as levels of local government could cover a configuration of competences and public services on different levels of public administration (national, regional, county, local or private sector).

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Research, Innovation and Development vs Regional Disparities across the European Union

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Abstract: The paper achieves a complex analysis of the present developments in R&D and innovation processes across the EU28. A distinct part of the paper deals with the analysis of the R&D and innovation activities at NUTS 2 regional level. The latest official statistical data were used in order to build a regional database related to R&D and innovation processes. The statistical data were divided into two categories: R&D resources and R&D results, which were analysed using comparative analysis, cluster analysis and regression. The macro trends in R&D and innovation processes are compared to those at NUTS 2 level. A special chapter in the paper is focused on R&D and innovation processes across the Romanian regions. The conclusions of the analysis, supported by tables and pertinent diagrams, are not positive. The R&D and innovation processes lead to increasing disparities across the Member States and regions. Romanian regions, excepting Bucuresti-Ilfov are not able to eliminate the gap in R&D and innovation development on short and medium terms.

Keywords: gross domestic expenditure on R&D; human resources in R&D; employment in high-tech sectors; high-tech patent applications

JEL Classification: O1

1 Introduction

There is no secret that R&D and innovation process become one of the most important supports for socio-economic development in modern economies. The importance of these processes is pointed out as a distinct goal of the Europe 2020 Strategy.

The “classic” gap between USA and Europe in R&D development has to be reduced if Europe wants to maintain its statue of main global economic actor.

There is a direct connection between the economic development and R&D and innovation development in the Member States. As a result, the first disparities

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between developed and less developed Member States result from the human and economic resources spent in R&D and innovation activities.

The above disparities become higher at NUTS 2 level. The most developed regions are in Sweden, Germany, Finland or UK. They achieved the best performances in R&D and innovation development processes. On the other hand, the Southern and Eastern NUTS 2 regions face to the worst performances in this domain.

2 Literature Review

There are a lot of scientific approaches on R&D across the EU28 and most of them are divergent. Some specialists consider that the recent economic crisis supported the increase of the divergent evolution in R&D in the Member States. In order to demonstrate this, they used sigma convergence indicator, which was able to point out the convergence/divergence process in R&D at regional level. Moreover, the European R&D system is not able respond adequately to the challenges of a sustainable development (Goschin, Sandu, & Goschin, 2014).

An interesting analysis covers the connection between R&D investment and marginal returns to labour. Using data from representative European companies, the paper quantifies the impact of the knowledge capital (R&D) intensity on the marginal returns to labour. The main conclusion of this study is that more knowledge intensive companies have an advantage in non-diminishing returns fast (Amoroso S., 2015).

Using the EU Industrial R&D Investment Scoreboard which covers many top world R&D investors, other specialists realised a quantitative analysis in order to point out the relationship between the companies' production function and the innovation implications of production (Montresor & Vezzani, 2015).

A distinct direction of analysis is the connection profit - investment in R&D. This analysis is made in the context of the distinction between uncertainty and risk. The authors develop Knight's approach related to the risky profit-maximizing scenario. They consider that R&D investments represent a main driver of the corporate profits (Amoroso, Moncada-Paternò-Castello & Vezzani, 2015).

The importance of the R&D in Europe led the European Commission to realize dedicated country's profiles for all Member States. According to this document, Romania faced to the challenge of improving policy coordination of R&I and upgrading the economy (European Commission, 2014).

3 Research, Development and Innovation across the European Union

According to Europe 2020 Strategy, the Member States succeeded in increasing permanently the gross domestic expenditure on R&D, even during the recent global crisis' period. The countries from Euro area achieved greater expenditure on R&D than EU average. Unfortunately, both regional economic entities are not still able to achieve the target of 3% of GDP for this type of expenditure (Eurostat, February 2016).

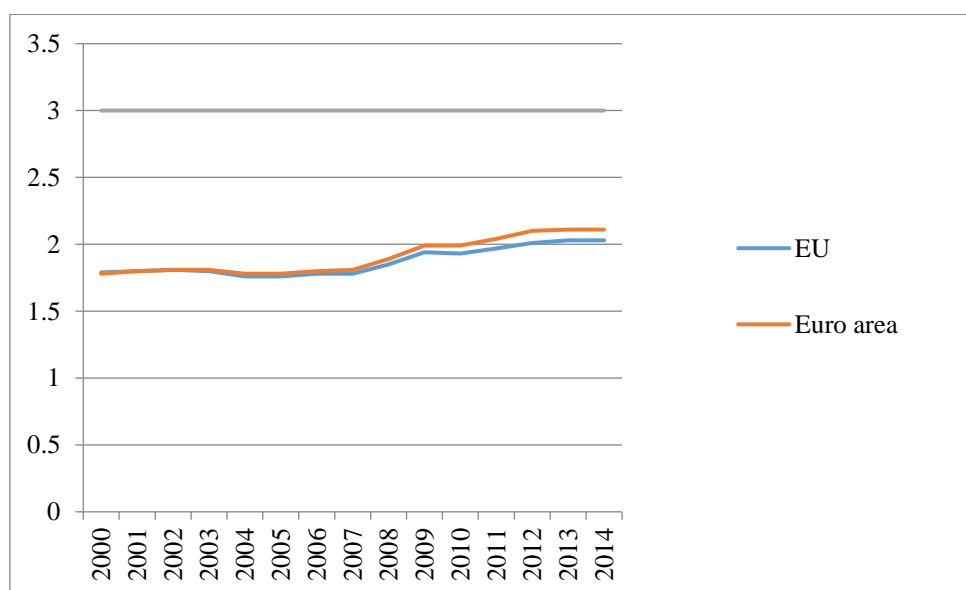


Figure 1. Gross domestic expenditure on R&D (% of GDP)

Source: Personal Contribution

According to Figure 1, a positive trend in R&D expenditure growth rate was realised by both regional entities during 2005-2014.

On the other hand, some Member States succeeded in achieving R&D expenditure growth rates in 2014: Denmark (3.08%), Finland (3.17%) and Sweden (3.16%). Unfortunately, there are other countries which faced to low rates, as: Romania (0.38%), Cyprus (0.47%) and Latvia (0.68%).

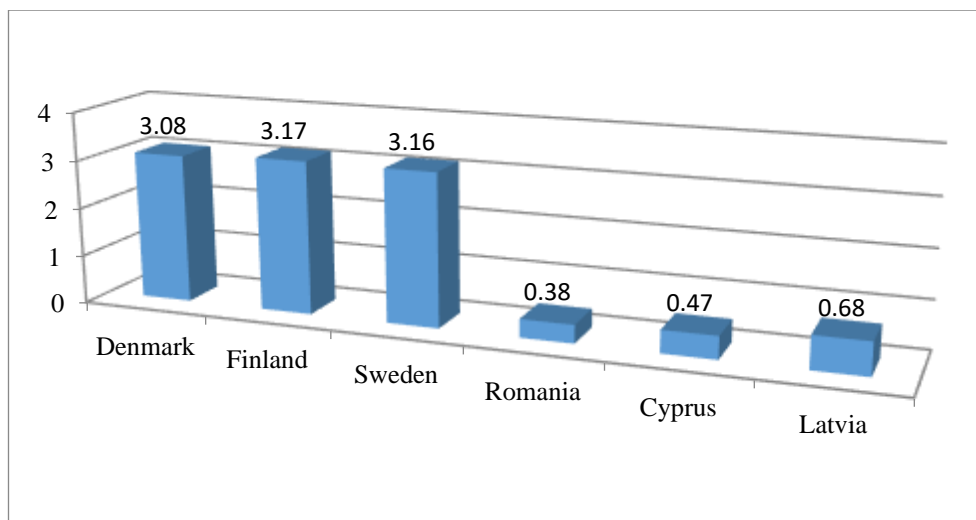


Figure 2. Gross domestic expenditure on R&D – maximum and minimum levels (% of GDP)

Source: Personal Contribution

The same indicator leads to greatest disparities at regional level. Some regions achieved high R&D expenditure growth rates: Brabant Wallon (11.26%), Stuttgart (6.19), Hovedstaden (4.95%), Midi-Pyrénées (4.81%), Steiermark (4.81%), Nordjylland (4.69%) and Tübingen (4.63%). Other regions faced to low growth rates: East Yorkshire and Northern Lincolnshire (0.08%), Centru (0.13%), Severen tsentralen (0.15%), Sud - Vest Oltenia (0.18%) and Severozapaden (0.18%). The Romanian regions have no important achievements related to the R&D expenditure growth rates. Moreover, Centru faced to the second worth performance across the EU regions at this indicator (Eurostat, 10th of February 2016).

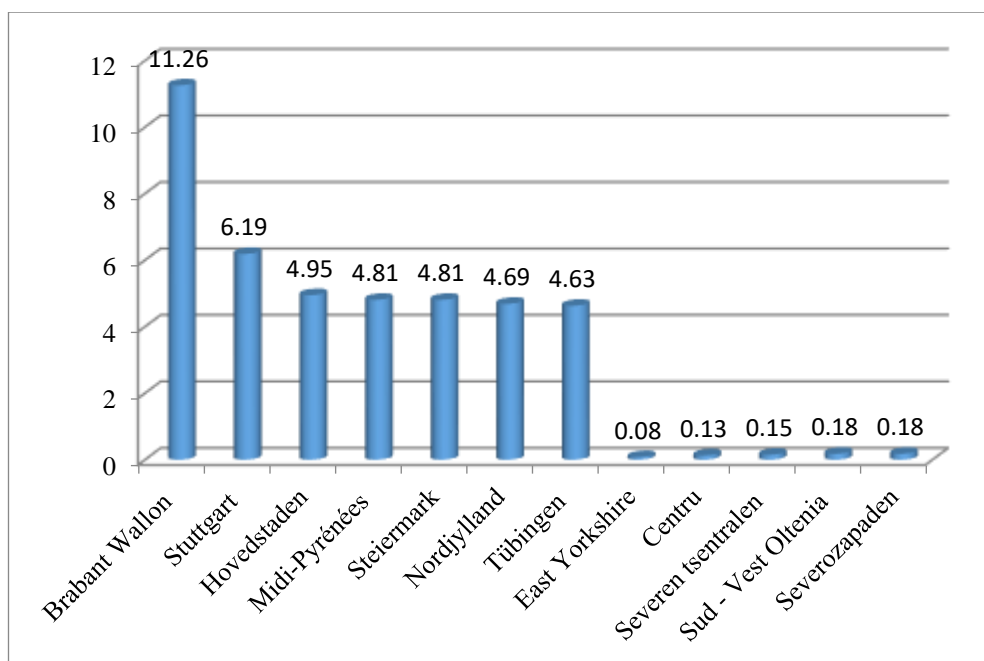


Figure 3. Gross domestic expenditure on R&D in NUTS 2 regions– maximum and minimum values (% of GDP)

Source: Personal Contribution

An interesting indicator is human resources in science and technology by NUTS 2 regions. It is quantified as % of active population (Eurostat, 2016). The greatest human resources in science and technology were placed in Inner London (69.3%), Stockholm (62.0%), Helsinki-Uusimaa (61.9%), Brabant Wallon (61.5%), Berkshire, Buckinghamshire and Oxfordshire (60.7%). At the opposite are the Romanian regions: Nord-Est (17.0%), Sud – Muntenia (18.1%) and Vest (21.2%).

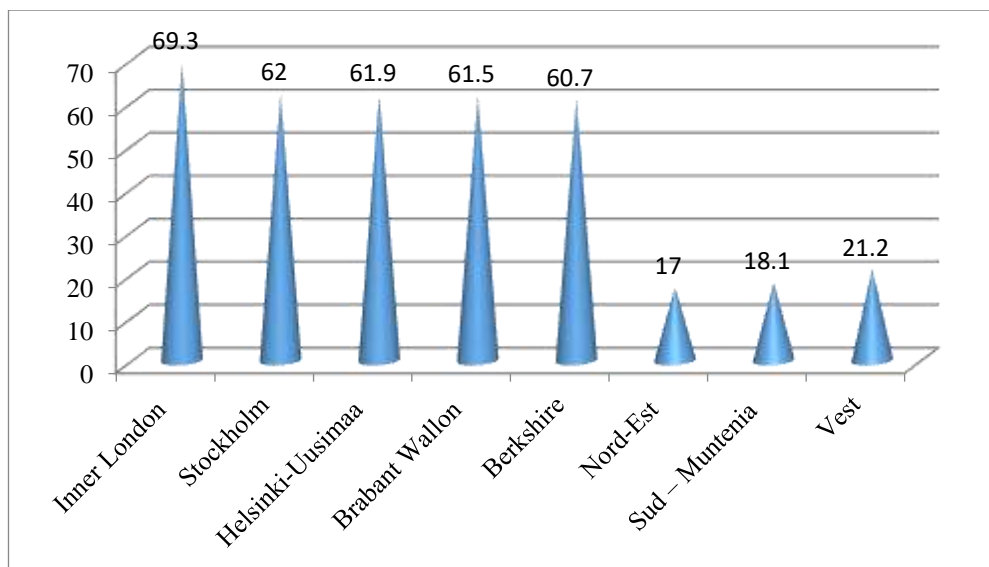


Figure 4. Human resources in R&D in NUTS 2 regions– maximum and minimum values (% of active population)

Source: Personal Contribution

A more focused indicator is the employment in high-tech sectors by NUTS 2 regions. It is quantified as % of total employment (Eurostat, 11th of February, 2016). The European regions which realized the highest employment rates in high-tech sectors are the following: Helsinki-Uusimaa (9.7%), Hovedstaden (9.5%), Praha (9.5%), Bratislavský kraj (8.7%), Southern and Eastern Greece (8.4%) and Brabant Wallon (8.2%). The lowest performances were in: Thessalia (0.6%), Anatoliki Makedonia (0.8%), Sud-Est (0.9%) and Peloponnisos (0.9%).

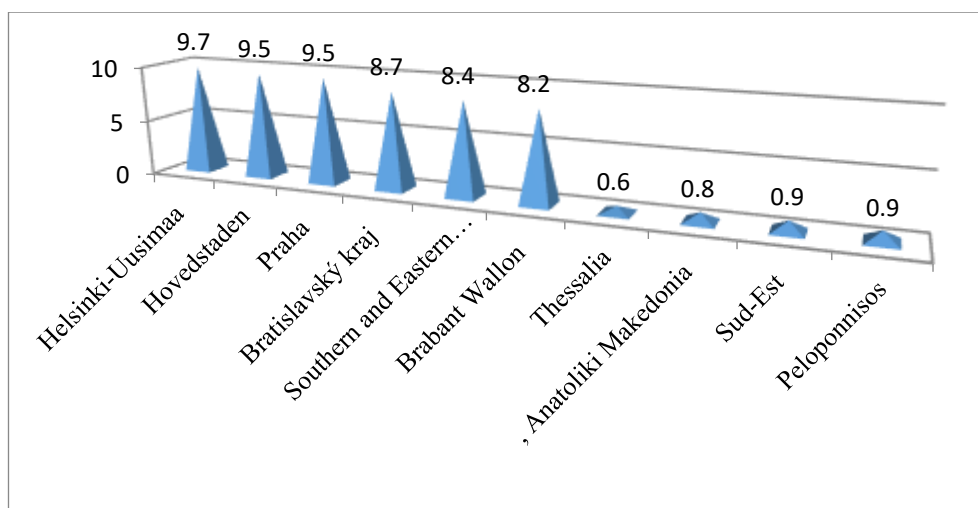


Figure 5. Employment in high-tech sectors by NUTS 2 regions – maximum and minimum values (% of active population)

Source: Personal Contribution

The results of the R&D activities are the high-tech patent applications to the European patent office (EPO). This indicator is related to every million inhabitants at regional level (Eurostat, 12th of February, 2016). The greatest performances were achieved in: Sydsverige (128.6), Karlsruhe (66.8), Mittelfranken (65.1), Vlaams-Brabant (64.0), Oberbayern (61.3), Helsinki-Uusimaa (57.7), Antwerpen (45.8), Île de France (38.5) and Hamburg (37.6). Other regions faced to lowest number of patent applications: Sud - Muntenia (0.1), Podlaskie (0.1), Illes Balears (0.1), Moravskoslezsko (0.1), Zachodniopomorskie (0.2), Cornwall and Isles of Scilly (0.3) and Merseyside (0.3).

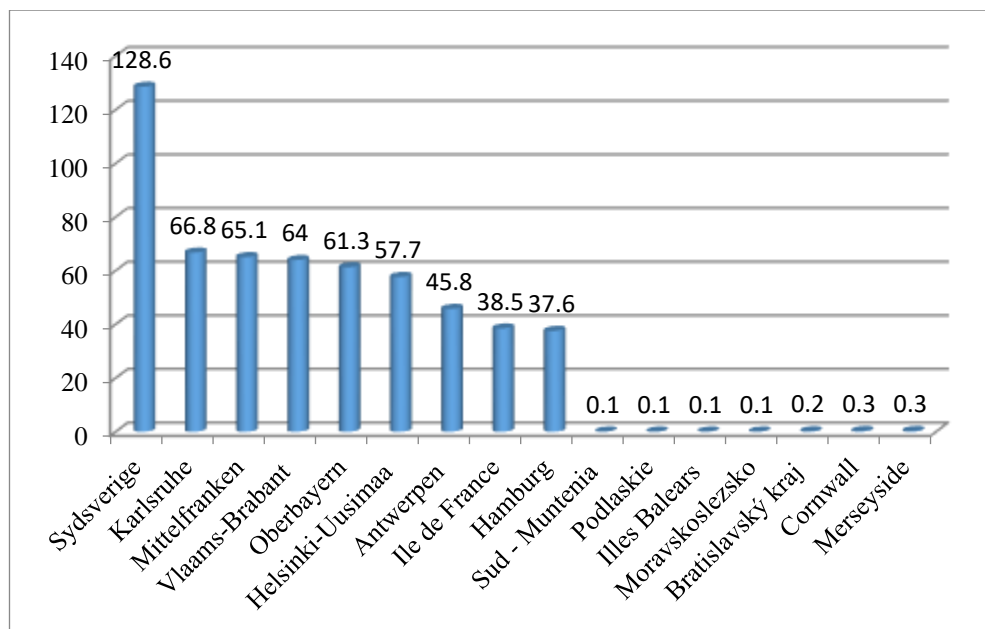


Figure 6. High-tech patent applications by NUTS 2 regions – maximum and minimum values (no. to every million inhabitants)

Source: Personal Contribution

The last representative analysed indicator is researchers as % of total employment (Eurostat, 13th of February 2016). The regions which achieved the best performances are: Brabant Wallon (2.6%), Bratislavský kraj (2.44%), Helsinki-Uusimaa (2.17%), Praha (2.11%), Braunschweig (2.09%) and Inner London (2.07%). The worst researches rates were realized in: Sud-Est (0.04%), Ciudad Autónoma de Ceuta (0.06%), Luxembourg (0.07%), Cornwall and Isles of Scilly (0.1%), Nord-Vest (0.1%) and Nord-Est (0.1%).

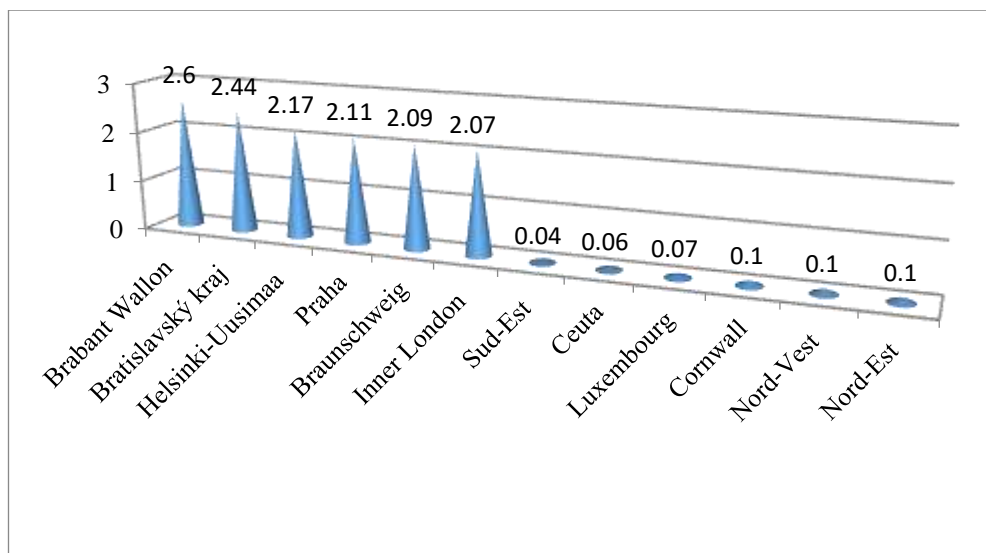


Figure 7. Researchers by NUTS 2 regions – maximum and minimum values (% of total employment)

Source: Personal Contribution

First intermediate conclusions support the idea that there are huge differences between the European regions related to R&D development. The most developed Member States achieved better performances, while the new Member States (Romania, Bulgaria) face to the worst. The Czech Republic seems to have a positive trend in this domain.

4 A Cluster Approach to the Romanian Regions under R&D Analysis

The Romanian regions have no positive achievements in connection to R&D development. Almost all the above indicators pointed out worst performances for these regions. But the comparative analysis is not enough in order to obtain a scientific point of view. As a result, a cluster approach can be usefully.

The above six indicators can be divided into two categories. The first one is R&D resources and covers gross domestic expenditure on R&D, human resources in R&D and employment in high-tech sectors. The second entity is focused on R&D results and covers high-tech patent applications and researchers as a result of the human capital's improvement.

The analysis points out at least two aspects: the R&D disparities across the Romanian regions and the R&D disparities between Romanian and the most developed European regions, as well.

The volume of analysed data was big and the analysis faced to difficulties in operating official statistical indicators. The newest official dates allow building the following database (see Table 1).

Table 1. R&D representative indicators

Region/ Indicator	NV (1)	Centru (2)	NE (3)	SE (4)	S (5)	Bucu- resti- Ilfov (6)	SV (7)	V (8)	Brabant Wallon (9)	Hel- sinki (10)
Gross domestic expenditure	0.32	0.13	0.30	0.07	0.35	0.79	0.18	0.26	11.26	3.98
Human resources	22.2	26.0	17.0	20.5	18.1	48.1	20.6	21.2	61.5	61.9
Employment In high-tech	2.4	1.9	1.2	0.9	1.1	6.8	1.2	5.4	8.2	9.7
High-tech patents	0.73	0.98	0.40	0.26	0.10	2.09	0.37	1.12	38.44	57.70
Researchers	0.10	0.13	0.10	0.04	0.13	0.88	0.13	0.20	2.60	2.17

According to Table 1, the Romanian NUTS 2 regions are analysed together to two developed European regions: Brabant – Wallon and Helsinki.

The R&D resources are analysed using Nearest Neighbor Analysis (NNA). The three R&D resources were presented using a three dimensional space (see Figure 8).

The Romanian region Centru (2) faced to the worst two from all three R&D resources. All Romanian regions were not able to obtain high performances related to R&D resources, excepting Bucuresti-Ilfov (6), which have better results but not well enough. On the other hand, there are huge differences between Romanian regions' performances and the two representative European regions.

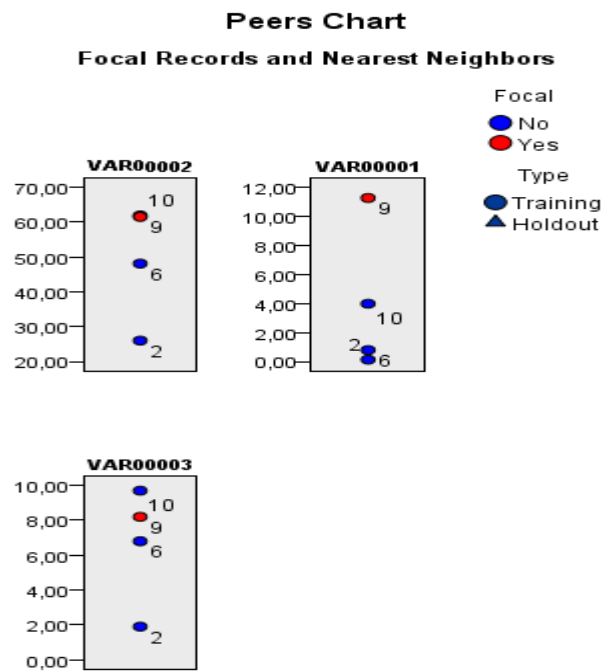
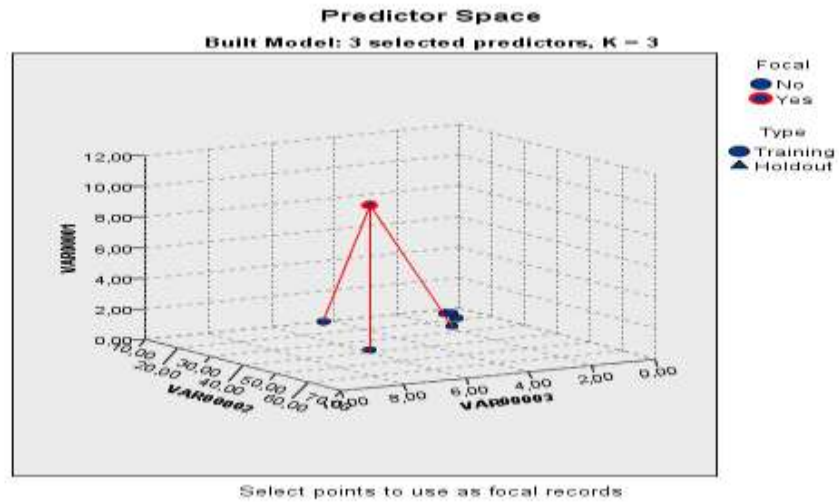


Figure 8. R&D resources by NUTS 2 regions (case study)

Source: Personal Contribution using IBM-SPSS software

In order to analyse the R&D results regression can be usefully. Under ANOVA conditions, both result variables lead to the following diagram:

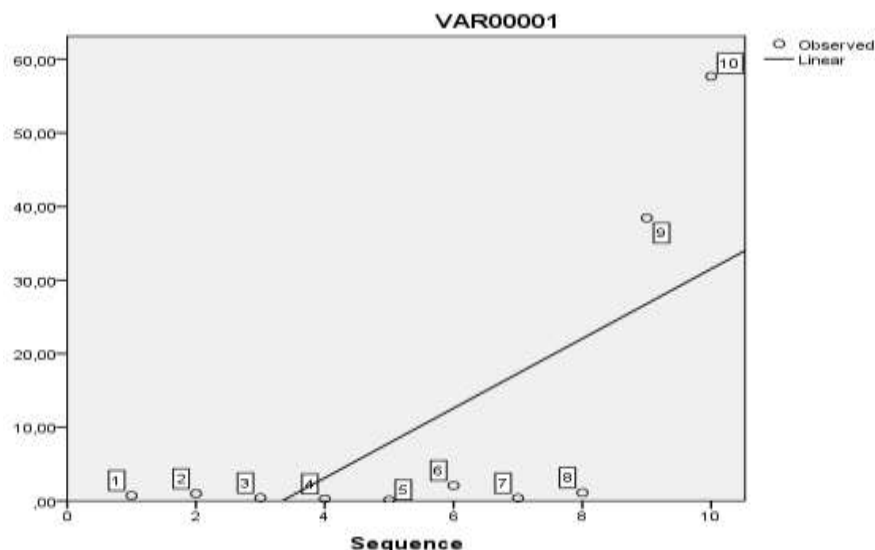


Figure 9. R&D results by NUTS 2 regions (case study)

Source: Personal Contribution using IBM-SPSS software

According to Figure 8, all Romanian regions are far away from the European developed regions. Moreover, there are high differences which cannot be eliminated on short and medium terms.

5 Conclusions

An important target of the Europe 2020 Strategy covers R&D activities' development. Unfortunately, R&D activities support the increase of the disparities across the Member States. Moreover, these disparities are greater at regional levels.

The regions from the Northern EU achieved better performances in R&D and innovation than those from the Southern EU. Some capital regions, as Prague and Helsinki, have good achievements, as well. On the other hand, regions from Bulgaria and Romania face to worst R&D and innovation performances.

Romanian regions are far away from the EU average in R&D and innovation activities, excepting Bucuresti-Ilfov. The gap between the most developed R&D regions and the Romanian regions is too great to be eliminating on short or medium terms.

The cluster and regression analysis in the paper lead to the conclusion that two distinct clusters can be built in Romania: first cluster covers Bucuresti-Ilfov, and the second one, which is far away from the first, covers the other seven NUTS 2 regions.

As a result, a new economic and political approach is needed in order to restart the R&D and innovation processes in the Romanian regions.

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Albania Residential Prices

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Abstract: The real estate market is complex and influenced by too many factors. Real Estate market in Albania has experienced a boom after the 1990. We have inherited from the communist system a very poor market of housing. The number of dwellings in 1990 in Albania was 219 dwellings per 1000 inhabitants and the useful floor space was 5 m² per person, but in Bulgaria number of dwellings per 1,000 people varies 465 and in Romania average useful floor space per person was 37 sq. The data used in this study are derived from the database of the World Bank, the Institute of Statistics, reports of Bank of Albania also from information provided individually on the ground and different sources. In this study is analyzed the relationship that exists between economic growth, remittances and the price of dwellings in Albania. The dependent variable is the average price of housing in major cities of Albania. Independent variables in the model are GDP per capita and the remittances. The Econometric model is a Linear Regress equation and the period are the years from 1998 to 2013. The model used is the statistical program EViews 6.0. Unfortunately the information let the desired, so we do not have an official detailed information on prices of Albanian real estate market. In Albania few researchers have been studying real estate market in Albania.

Keywords: housing market; economic growth; remittances; price of dwelling; linear Regress equation

JEL Classification: R2; P2

1. Introduction

Albania is a small country (28,748 square km), population 3,2 millions and it's in the west part of the Balkan Peninsula. It has a favorable geographic location because it is an intersection of the roads passing from the west Mediterranean sea to Balkan and Asia and controls the passage through the sea canal of Otranto. In 1944 after the finalization of World War II, Albania was included in the group of the communist countries of East Europe. In 1946 Albania became formally all known as National Republic of Albania, and the regime of the dictator Enver Hoxha was established and remained for 45 years in a row. Albania was the only place out of all the countries that went through a communist regime that eradicated all elements of private

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property. The state was the owner of everything. In 1945-1946 a reformation upon land property took place. Also a redistribution concerning agriculture and lands took place. The new owners of the land did not get any documentation concerning their new property. Later the same reform took place in urban areas as well. The owners lost their right upon their properties and the only legal owner from then on was the state. The owners of private dwellings that remained in their homes only had a right to that property and nothing else other than that house, not the land on which the house was built nor the yard around it. All lands belonged to the state. The real concept of property, owning and respect of that property remained in the subconscious of some owners that unfortunately were persecuted more than everybody else from the communist regime. After that long period of persecutions the idea of private property disappeared. Many owners throw away their documentations, because they were afraid that the documents may be found by the government. The communist state took away everything from the previous owners. These owners for 50 years underwent a continuous persecution that was often cruel.

Urbanization in Albania from 1945-1990 was under the state's strict control. In order to construct a modern and industrialized socialist society, till the 1960 the governing of the only state party encouraging the development of industry and constructing sector. This politic brought a rapid increase of the urban population. From 1950-1955 the state saw an annual increase of 7% of the urban population. Even though from 1961-1990 the government started to limit urbanization. The development of big cities got limited and the development of smaller cities became a priority. Big cities continued to be constructed but under the "yellow line" area – Borders of the city set by the urban master plans. The reason why it got limited was mainly because the urban area enjoyed better life conditions compared to the rural areas, which sometimes lived in really hard conditions and lacking infrastructure. The government in the period released local passports or identity cards, put employment restrictions on state enterprises on cities, in order to keep people in the village. Transferring from the village to the city would get easier only if the authorities would give you permission to transfer, this process was called at the time "pasaportizim". These politics were similar to the ones that other Soviet states followed. Before 1991 the strict legal control on local migration resulted in a non-efficient territorial distribution of the population. In the beginnings of the transition Albanian population was 75% rural- a high percentage in the end of the 20 century. The socialist regime had declined all the peoples need for accommodation. Until 1991 the people didn't have private property, they had the right to use them but they had to pay for it, and apartments which were 70% of the offers for urban accommodation. The consumption of residential area was 5m² in the urban areas. In Albania all the urban accommodations were states property. The main characteristics of requests for housing in Albania until 1990 reflected the demographic developments. In 1989 Albania had a population about 3.2 million people. In fact, the average annual growth rate during the 80's was 2% and population growth was most rapid than in the other

part of Europe, for this reason the population of Albania was relatively young and the average age reached 26 years old. Such demographic characteristics impose an increase in demand for real estate. The demand for housing was influenced by the family structure with many people and the impact of culture¹. However, an increase in the number of families make it easier to increase the population that tends to create smaller families with a smaller number of people, about 4 or 5. Exactly the number of households grew 35% while the population grew only 25%. Trends of the state investment in buildings and housing completion includes several aspects. Until the 1970s it was destined to continue increasing the number of new housing. By 1970 the goal of building plan apparently was not completed. This was to reflect the decline in average age. In fact, the attention of the Albanian authorities after 1970 was focused on first, alleviate the quantitative problem of the apartments state, second needed replacement for the existing stock of housing, 20% of which were built before 1945 and third increased attention to the quality of construction, fourth of all faster methods of building. Another factor affecting the reduction of new buildings after 1970 had to do with the reduction of voluntary programs to build new housing. Sometimes individual buildings had taken an important role in the village. During the 80s it was intended as a percentage downward in state investments in general. Meanwhile the authorities were fighting for the distribution of new housing by 50% in practical terms was announced a fluctuation of age to the number of persons that will be completed with new homes. In the beginnings of the 1990 there was no new housing market due to lacking of capital. Albania came from a very difficult period and total poverty, Albanians didn't own any kind of private property or cash. With total privatization of urban houses in 1992 created a stock of existing housing, this stock together with informal constructions were a spontaneous response to market demand, between 1990 and 1994 belong to the category of "fast privatizes" as much as 67.5 per cent of the already small share of public rental stock had been privatized, 55 per cent in Croatia, 74 per cent in Romania and 98 per cent in Albania (Hegedus).

Until 1990 all agricultural land where property of the state in the form of organizations called "cooperative". In 1991 the lands were transferred in two different ways: cooperative lands were privatized by former cooperative, while former state farm workers were given only the right to use their own. The Albanian government distributed lands that in most cases were property of ex-owners. This resulted in a continuous conflict with these former owners, whose property had been stolen since 1945. In 1991, the removal of restrictions on internal migrating gave a way to a massive internal migration from rural areas and the country's northeast to western and coastal area. While socialist industry had created a small number of industries, such as mining in the northeast, most of them ceased operation in 1991, this region was not suitable for agriculture and job opportunities were very limited

¹ By tradition the boy would keep the apartment and will be shared it with his parents.

as a result people started to move toward big cities to search for better economic opportunities. Insecurity of land tenure and the gaps in the legal framework, created by the collapse of the communist regime, made it easier for people to ask for a lot on vacant land on the outskirts of cities, in the absence of rules and laws, the only way to develop land and build houses was that they did it informally. Taken lands were owned by the former owners, former state property and other public spaces People construct wherever they find a piece of land free in a totally abusive way.

It is estimated that from 60- 70% of the dwellings made from 1990 up to now, they are 1 008 243, about 270.000 of them are illegal. ALUIZNI, investment of 3 billion \$ (32% of GDP) was created in 2004 to end informality in economy and to start the process of legalization of the illegal buildings and also improve the relationships between former owners, illegal builders and the state.

According to the calculations of ALUIZNI in Albania exist 681 informal zones out of which the 3/4 has become private and state property and 1/4 belong to former owners.

The legalized properties entered the National System of Property Registration through the cooperation between ALUIZNI and the National Property Registration office, this has affected the state budget significantly. Only through urban property taxes, 270000 illegal buildings give about 14 million \$ or 0,15% of PBB every year, whereas the cost of transferring can give about 459 million \$ or 4,9% of PBB, considering other legal payments the amount can reach 690 million \$ or 7,3% of the GDP. From the legalization process 8 billion Alb Leke were cashed(1 Euro= 134 Leke). However the issue of property in Albania remains one of the most delicate matters due to the problems that it bears.

2. The Methodology and Model

This study used quantitative methods of research because it is the nature of such variables. The data are collected from many sources, because it is not easy to find reliable sources of information in the field of real estate in Albania. Econometric model is an Linear Regress equation and the period that is taken in the study are the years from 1998 to 2013. To realize econometric model is used statistical program EViews 6.0 The study was spread over a period of 15 years for the reason that there is a lack of data regarding the price of real estate in the country before the 90s did not existed a real estate market. Even in the early 90s when there was a market launch of real estate in Albania, most transactions realized in informal. To eliminate the problem of small number of observations, provided data are expressed on a quarterly basis and in total are 60 observations. General factors affecting the housing market in Albania, the most important are income per capita and remittances or incomes of Albanian emigrants in developed countries. This is because GDP per capita is the

best variable that expresses the economic increase of a country. Increased revenues increased consumption, than people will also increase their consumption of houses, increasing the demand for housing will increase their prices also. So, housing prices are highly correlated with income per capita. Remittance variable is included in the model because in the case of Albania, it represents the main income entered in Albania after 90s from Albanian emigrants,

The purpose of the regression analysis is the prediction of dependent variables values depending on the independent variables, regression analysis can also explain the variation responsible for a particular outcome and can help build predictive models (Field, 2009).

3. Development of the Housing Market in Albania

Albania inherited from the Communist system bad housing conditions, until 2011 in Albania are built 1,008,243 units, of which in urban areas 542 385 units and 465 858 units in rural areas (Census Albania)

From the year 1970-1990, in Albania is built around 2/3 of the current stock compared to about 40%, which were built in Estonia, Poland, Slovakia, Hungary. (Hegedus)

After 1990 were built about 15% of construction, but here we must say that it does not include informal buildings that have been made over the years and estimated to be around 270,000 thousand informal buildings across the country.

In Albania after 1990 until 1997 were created the first elements of the real estate market. According to Law No. 7652, in 1992, was realized the privatization of housing. Albania realized the privatization of apartments (about 98% of existing stock) in a year, being the country that has committed this privatization faster than all countries of Central and Eastern Europe (Hegedus).

In Albania, the strategy that was followed for the privatization of housing, in terms of the high level of inflation and the lack of funds of Albanian families, was "free" privatization or almost free, different from the strategies of privatization reforms that were followed in the communist countries, in Bosnia and Herzegovina was conducted with privatization coupon, in Bulgaria, Romania, Serbia and Montenegro were privatized with discount and privatization in Russia with 50% of the price of the apartment (Hegedus). The development of real estate market suffered a kink in the period 1997 to 1998. The flourishing of pyramid with interest rates, do not attractive investment in real estate. Many sold their homes to place afterwards money in pyramid schemes and so the housing market offers was great, while demand was low. (L.Sila)

The collapse of pyramid schemes plunged the economy into crisis, most of the population lost money invested in them, contributing directly to the construction and reducing demand, the housing market underwent significant changes. In this period there was a decrease in the number of apartments offered for sale.

The years from 1997 to 1998 are total crisis years, the inflation rate reached 42% and an economic recession, these factors coupled with increased exchange rate of the dollar and the devaluation of deep appreciation, purchases in real estate market paralyzed because investors owned denominated monetary assets. In 1996, the majority of the stock of other occupied buildings, only 23% consisted of the housing market.

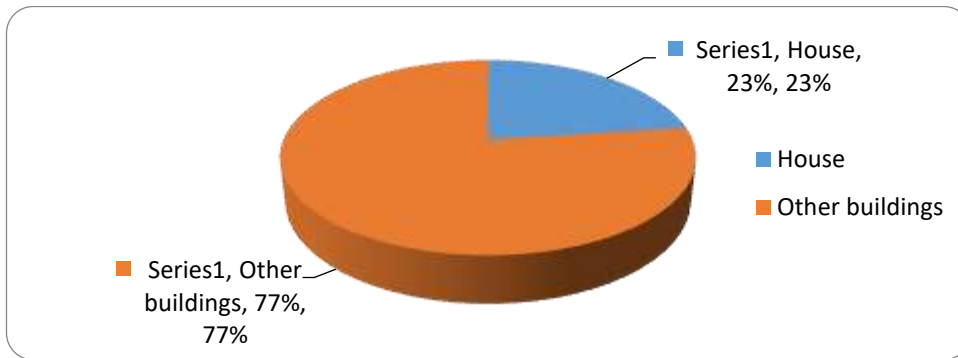


Figure 1. Structure of construction in 1996

Source INSTAT

This fund structure construction in Albania has changed over the years, in 2009, the apartments constituted 82% of the fund while other buildings were only 18%.

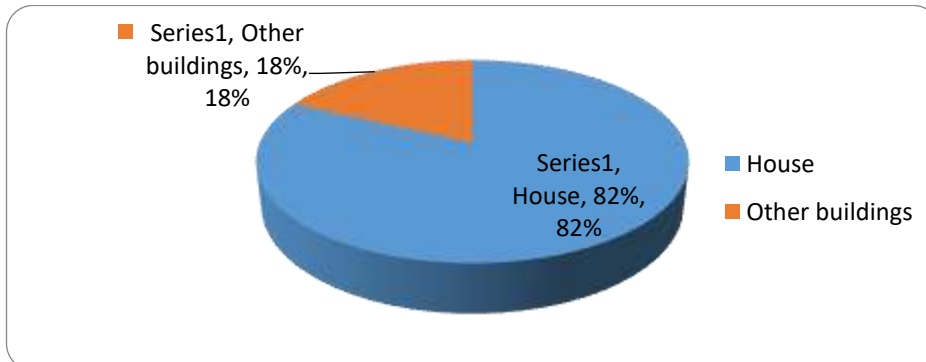


Figure 2. Structure of construction in 2009

Source INSTAT

In 2013 the structure of the real estate was 67% houses and 37% other buildings. After the 2000 s the real estate market in Albania experienced a boom. In Albania, many individuals rushed to use their monetary savings in this market, everyone in our country seemed to agree that housing prices will continue to rise. If we will try to list some of the reasons for the growth of house prices in this period can say that housing conditions, both in terms of number of dwellings for families, if floor space per person, in Albania still be far from average rates in the region or Europe, we inherited from the communist system very bad conditions of residence.

The development of real estate market in Albania change from boom to recognize other regional countries in this field, in countries such as Hungary, Bulgaria and Montenegro, the boom was caused by the desire of people to buy second homes or third, in Albania demand is high, particularly for the main dwelling.

Very young average age of our country's population (29.7 years) is another element that shows that demand for housing will continue to be higher. The most important group of people in connection with the development of residential real estate , is the group between 25 and 40 years old. The economically active age group represents greater demand at houses, in 2005 this age group accounted 601 thousand inhabitants and in 2008 accounted 674 thousand inhabitants.

Internal migration continues to be still very high. An average per year of people that have migrated to urban areas was 20300. According to INSTAT, in Tirana and Durres, in 2001 lived 22.9% of the total population, in 2006 lived 25.5%, and in 2011 lived 28%. According to the forecast in 2021 in these cities will live 32.4% of the population, or approximately 10% more than in 2001.

This period coincides, as well as increasing the level of remittances from emigrants. Remittances have increased in 30.6% in 2004 compared with a year ago. In 2008, remittances amounting a maximum of 1,495,038 million dollars, this year after growing worldwide effects of the crisis became evident in Albania, remittances have decreased every year, in 2011 they fell by 20% versus 2008.

3.1 Price / income (P / I)

This report is one of the most important indicators of market analysis of residential apartments because they cannot judge the level of housing prices, without comparing the average price of an apartment with GDP per capita, or wage levels determining so the real value of residential apartments.

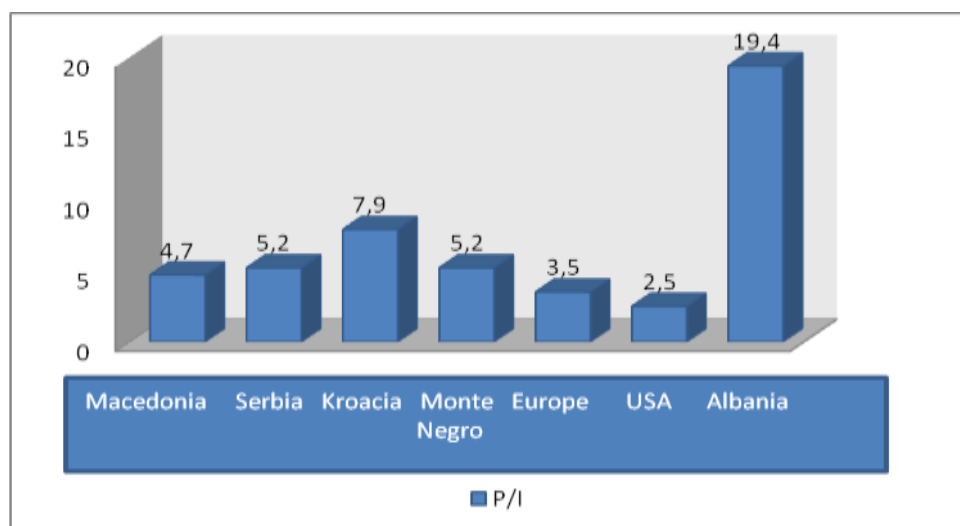


Chart 1. Price / income per capita

Source IMF

As can be seen from the graph, the ratio in Albania is very high (has a value of 19.4), compared not only with European countries (the price / income ratio is 3.5) and the US (the price / income ratio is 2.5), but also in comparison with other countries of the region.

This is not because of the level of housing prices in Albania, which nowadays are much lower than other countries including those in the region, but because we are the country with the smallest GDP per capita compared to other countries in the region.

An apartment with an area of 68 square meters in Tirana, (prices are higher in Albania), costing 76 thousand euro, while at Prague costs 169.048 euro, in Berlin 108.392 euro, 179,000 euro WARSH in Budapest 87.720 147.220 euro in Vienna and Rome 266.900 euro.



Chart 2. Housing prices in some cities of Europe

Source Tsenkova

From the chart 3, we observe that the number of salaries, which need to purchase a residential apartment in Tirana is 282, while at Prague is 191, 246 Warsaw, Budapest 129, so far from the countries of Europe, where as seen in Lisbon and in Vienna needs only 46 months salary, so it would take 3.7 years on average to buy a residential apartment in Berlin would take only 2.5 years, while in Tirana it would take an average of 23.5 year of work for an employee with average income, this is not for politicians nor businessmen.

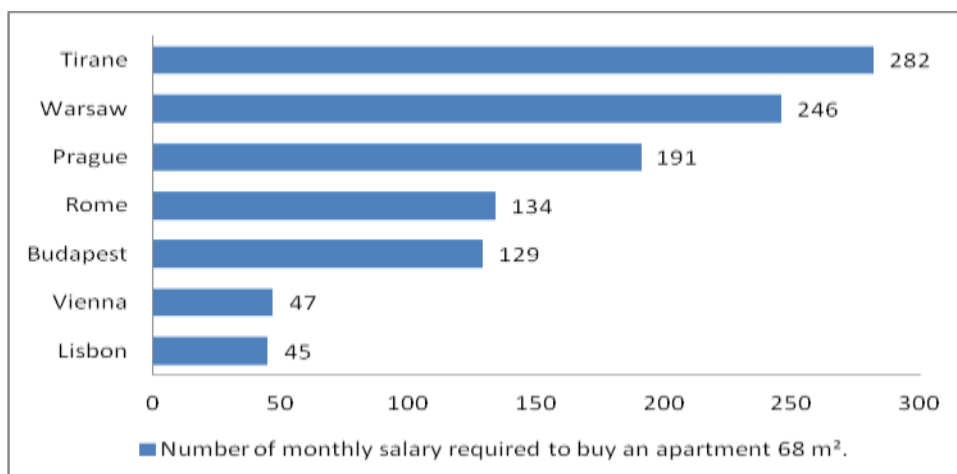


Chart 3. Number of monthly salary required to buy an apartment 68 m²

Source Tsenkova

3.2 .Number of dwellings per 1000 inhabitants

Albania is a country with less care for residents of the apartment, although after 90 years there have been some drastic improvements in comparison with the communist period. Data Comparing with other transition countries shows, the number of dwellings in Albania, is now 254 dwellings per 1000 inhabitants, and before the 90s, the stock of housing was 219/1000 inhabitants (IMF and Hegedus).

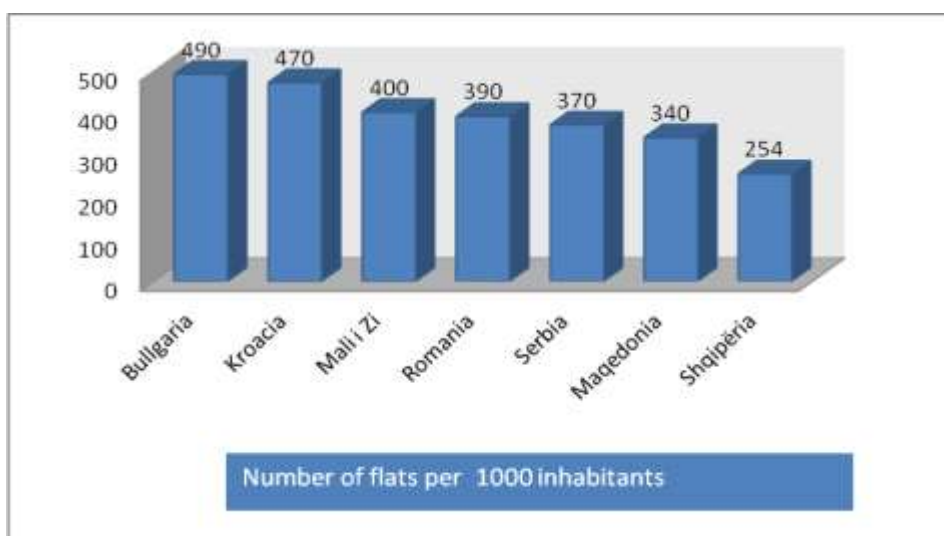


Chart 4. Number of dwellings per 1000 inhabitants

Source Jozef Hegedus

However this indicator, in Eastern Europe, is much lower than the average for European countries, this even though GDP per capita in the region, about one-third of the average GDP in the EU (Bank of Albania), which affects the amount of available investments to improve housing conditions.

Albania's accommodation rates continue to be very poor and young population is expected to bring high demand for apartments in future. Demand for apartments in Albania continues to be high even after many years of investment, but on the other hand, the construction sector fails to provide apartments for Albanians with middle income. Today, apartments in Albania cost much more than the possibilities of a family with middle income.

3.3 Econometric analyses of the most important factors affecting the housing market in Albania

Econometric model is a Linear Regress equation and the period that is taken in the study are the years from 1998 to 2013. The study was spread over a period of 15 years for the reason that there is a lack of data regarding the price of real estate in the country before the 90s did not existed a real estate market. Even in the early 90s when there was a market launch of real estate in Albania, most transactions were made in informally. To eliminate the problem of small number of observations, provided data are expressed on a quarterly basis and in total are 60 observations.

Table 1. Data of macroeconomic variables

Year	GDP(million \$)	Remittance(million \$)	Average price of residential (\$/M ²)	Gross income /capita \$
1992	709,452	151,8	-	280
1993	1228,071	332	-	310
1994	1985,673	307,1	-	380
1995	2424,499	427,3	-	630
1996	3013,218	550,9	-	850
1997	2196,224	300,3	-	750
1998	2727,745	504,14	154,17	820
1999	3434,402	407,2	230,55	910
2000	3686,649	597,8	287,23	1090
2001	4091,02	699,3	312,1	1250
2002	4449,373	733,57	330,6	1320
2003	5652,325	888,748	416,7	1580
2004	7464,447	1160,672	542,7	2030
2005	8376,483	1289,704	615,7	2540
2006	9132,562	1359,467	706,17	2940
2007	10704,661	1468,02	798,9	3310
2008	12968,653	1495,038	903,03	3850
2009	12118,58	1318,476	877,37	4030

2010	11858,166	1156,021	789,2	4040
2011	12959,564	1125,784	836,66	4050
2012	12340,013	1027,546	701,8	4090
2013	12 920,59	1093	630,5	4110,25

Source Bank of Albania, INSTAT, World Bank

General factors affecting the housing market in Albania, the most important are income per capita and remittances or incomes of Albanian emigrants in developed countries. This is because GDP per capita is the best variable that expresses the economic increase of a country.

Increased revenues increased consumption, than people will also increase their consumption of houses, increasing the demand for housing will increase their prices also. So, housing prices are highly correlated with income per capita.

Remittance variable is included in the model because in the case of Albania, it represents the main income entered in Albania after 90s from Albanian emigrants,

All countries in the world have incomes from remittances, but the feature in the Balkans and in Albania is that the remittances have had a significant weight in economy balance. This phenomenon is evident in Albania and Bosnia-Herzegovina. (Doing Business). In Albania most emigrants have invested in real estate as the most secure investment.

It would be important to own info, about the proportion of remittances used in construction and in housing in all country. We have evidence that the two main cities, in our country, in the city of Durres for investments in construction uses 8% of remittances and in Vlore uses 10% of remittances for investment in this, the rest is uses for consumption, education , business and other activities (Kring 2007)

Dependent variable will be the average price of real estate in major cities of Albania, for the reason that it has a deep difference between prices in the main cities with the prices in the rest of the country.

The data for GDP per capita are provided by the database of the World Bank and are expressed in \$. Remittances are also provided by the same source and are expressed in million \$. Data on real estate prices are provided by the Local Offices of Real Estate, Newspaper” Celesi”, database of real estate agencies as well as research in area. To adjust other variables the price of real estate is expressed in \$ too.

Table 2. Average prices of real estate in major cities (in 000 ALL / m2)

Year	Tirana	Durres	Vlore	Elbasan	Shkoder	Fier	Berat	Lushnje	Kavaje
1998	37	29	27	20	21	25	20	10	20
1999	40	40	37	32	29	33,7	26	19	29
2000	51	53	50	41	38	40	31	26	41,5
2001	55	60	48	43	40	43	33	38	43
2002	58	61	49	44	42	45	34	39	45
2003	66	65	55	46	46	48	39	42	50
2004	72	71	63	51	52	54	38	45	56
2005	82,5	80	71,3	53	58	60	40,6	46	62
2006	102	86	85	55	66	67	45,9	47,6	69
2007	105	89	88	58	68	70	47,9	52,3	72
2008	112	96	94	59	70	72	50	54,8	74
2009	124	110	108	65	74	76	55	60	78
2010	122	108,2	106,3	64	73	74,8	54,1	59	76,8
2011	125,6	111,4	109,4	65,8	75	77	55,7	60,8	79
2012	113	100,3	98,4	59,2	67,4	69,2	50,1	54,7	71
2013	100,8	89,4	87,8	53	60,2	61,8	44,7	48,8	63,4

Source World Bank, IMF

3.4 Linear Regression Equation

To realize econometric model is used statistical program EViews 6.0 and data processing result was below the regression equation.

$$Price = -202.84 + 0.0559 * GDP / P + 0.00038 * Remittances$$

Test 1. Econometric Analyses

Dependent Variable: CMIM

Method: Least Squares

Date: 08/12/14 Time: 16:05

Sample: 1999Q1 2013Q4

Included observations: 60

<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
<i>C</i>	-202.8397	14.67808	-13.81923	0.0000
<i>GDPP</i>	0.055781	0.002324	24.00135	0.0000
<i>REMIT</i>	0.000384	1.64E-05	23.36644	0.0000
<i>R-squared</i>	0.982200	<i>Mean dependent var</i>		587.1558
<i>Adjusted R-squared</i>	0.981576	<i>S.D. dependent var</i>		233.8137
<i>S.E. of regression</i>	31.73690	<i>Akaike info criterion</i>		9.801544
<i>Sum squared resid</i>	57412.16	<i>Schwarz criterion</i>		9.906261
<i>Log likelihood</i>	-291.0463	<i>Hannan-Quinn criter.</i>		9.842505
<i>F-statistic</i>	157.653	<i>Durbin-Watson stat</i>		0.095988
<i>Prob(F-statistic)</i>	0.000000			

In the model generated by the program we see that the coefficient R2 Adjusted , which is a better evaluated than R2, has a value of 98.15% which means that 98.15% of the price of assets in dependent variables will be explained by independent variables included in the model and the remaining 1.85% will be the remaining term that includes other factors which cannot be included in the model.

If we analyze the sign of the coefficients β_1 and β_2 we will see that independent variables have a positive impact on the price of assets, referring values we will have this analysis.

□ If GDP / P variable will change with a unit and Remittances will remain unchanged, dependent variable will change with 0559 units.

□ Also if Remittances variable will change with a unit , holding unchanged the GDP / P variable, dependent variable will change with 0.00038 units.

To test the overall importance of the model we will use the Fisher test. These data indicate that the coefficient F has a value of 157.65 which is many times higher than the critical F with [2 ; 58] freedom degree and importance coefficient $\alpha = 0:05$ which in our case has a value of 3.15. From this comparison we refuse the zero hypotheses and accept that the model that we have built is important.

To test the importance of individual independent variables we will use the t student test. The value of t test for GDP / P variables and Remittance is specifically 24 and 23:36 and it is many times greater than the *Critical t* with [60-2] freedom degree and importance coefficient $\alpha = 0:05$ which in our case would be 2. From this comparison we refuse the zero hypotheses and accept that the independent variables are important.

Also if you want the model that we have built to be accurate it should fill Method of Least Squares (OLS) assumptions, that means that β coefficients are BLUE (Consistent, impartial and efficient).

Homoscedasticity Testing

To test the presence or not of heteroscedasticity in our model we will use ARCH test.

ARCH test is a procedure of auto regression on the residuals square over time:

Hypothesis:

- $H_0: \phi_1 = \phi_2 \dots = \phi_p = 0$ Homoscedasticity
- H_a : At least a factor $\neq 0$: Heteroscedasticity

The test results obtained from ARCH test confirms that the value of $n * R^2 = 36.11$ is less than the critical value $\chi^2_p = 79.08$. So our model does not suffer from heteroscedasticity.

Testing the normality of the distribution of the residue.

To test whether the residue have normal distribution would use Jarque Berra test - which tests in general whether the distribution is normal or not.

Hypothesis:

H₀: Normality (good parameters for prediction)

H_a: Lack of normality (settings are not good for forecast)

From the test results we see that the value of the Jarque-Bera coefficient = 3.21 is less than the critical value of $\chi^2(2)$ whose value is 5.99 the importance coefficient $\alpha = 0:05$. So we are within the area of acceptance of the hypothesis zero which means that the residue have normal distribution.

Autocorrelation testing

If in a regressive model residues are correlated by themselves in the past than this model suffers from autocorrelation. To test the autocorrelation of the first instance, we will use the statistic Durbin - Watson.

Hypothesis:

Ho: Lack autocorrelation

Ha: Autocorrelation (settings are not good for forecast)

Since a model does not suffer from autocorrelation, coefficient DW should be equal or close to 2. In the case of our model coefficient value of $DW = 0.09$, which means that our model suffers from a pronounced positive autocorrelation.

In this situation to correct the presence of autocorrelation, we will use several techniques.

- The first way to solve the problem of autocorrelation is its transformation through differentiation of first instance.
- The second way that we used is the inclusion of a term auto regression AR (1) in our equation.

Analyzing equation derived from modifications we will see that DW coefficient reached a value of 1.85 which is close to 2. In this way we have achieved through interventions to eliminate the presence of autocorrelation in our model.

Testing of Multicollinearity.

To test multicollinearity means to test if there are strong correlations between variables or explanatory or independent. In such cases should be done to eliminate these links in order to obtain a better model.

To identify the links between variables we build a matrix of correlations.

Table 3. Correlation between variables

Correlations	Price of real estate	GDP/P	Remittances
Real estate prices	1	0.901	0.895
GDP/P	0.901	1	0.643
Remittances	0.895	0.643	1

By analyzing the correlation table we will see that the relationship between GDP / P independent variable and Remittance is positive but that does not adversely affect the model and therefore we can say that the model does not suffer from multicollinearity

If we analyze the relationship of dependent variables with independent variables will have the following conclusions:

- Relationship of price with GDP / P is at a high level with a correlation coefficient of $r = 0.901$. This link also finds support in theory because a GDP growth in a country would lead to increasing prosperity and necessarily real price increase.
- Relationship between price and remittances is a strong positive link because the value $r = 0.895$. This connection is supported from the theory because if we refer trend in Albania will see that the majority of remittances brought by immigrants is invested in real estate and therefore the relationship stands. The model we built satisfies all OLS method assumptions and thus it is specified model and coefficients α and β and are consistent, impartial and efficient (BLUE).

4. Conclusions

The real estate market in Albania was created after 1990, with the privatization of apartments built during communist rule, during this period residents pay a symbolic payment as rent and apartments were owned by the state. Structure of real estate has changed over the years, until 2000 other buildings occupied up to 70% of the stock of real estate, after this period the weight of dwellings has increased annually, in 2009 housing accounted for 82% of stock of real estate.

Report P / I in Albania is the highest compared to other countries, about 19.4, that for reasons of low income per capita of the population and not the high price of housing. To buy an apartment 68 m² in Albania should be 282 months of work are needed.

The number of dwellings in Albania was 219 dwellings per 1000 inhabitants in 1990 and the area was 5 m² per capita. Development of Real Estate market in Albania is different from other countries. In Hungary, Bulgaria and Montenegro, the boom was caused by the desire of people to buy second housing, but in Albania the demand was for the main dwelling.

Although linear regression model that benefited above meets the requirements to be a good model as well as meets OLS method assumptions it has its limitations.

Firstly, as mentioned earlier real price variable is an average of the average prices of the main cities of Albania. But prices inside them had a high standard deviation, which affects negatively the model.

Secondly, although data on variables that are under study are provided from World Bank statistics, data on housing price are the fruit of research in the field, because unfortunately the information on prices of real estate in Albania, leaves a lot to be desired so we do not have an official detailed information on prices of Albanian real estate market.

Finally a study to be good and reliable, its conclusions must comply with those other researchers in the field. This condition is not very applicable in our country because few researchers have been studying real estate market in Albania.

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Appendix

Heteroskedasticity Test: ARCH

F-statistic	89.92994	Prob. F(1,57)	0.0000
Obs*R-squared	36.11154	Prob. Chi-Square(1)	0.0000

Test Equation:

Dependent Variable: RESID²

Method: Least Squares

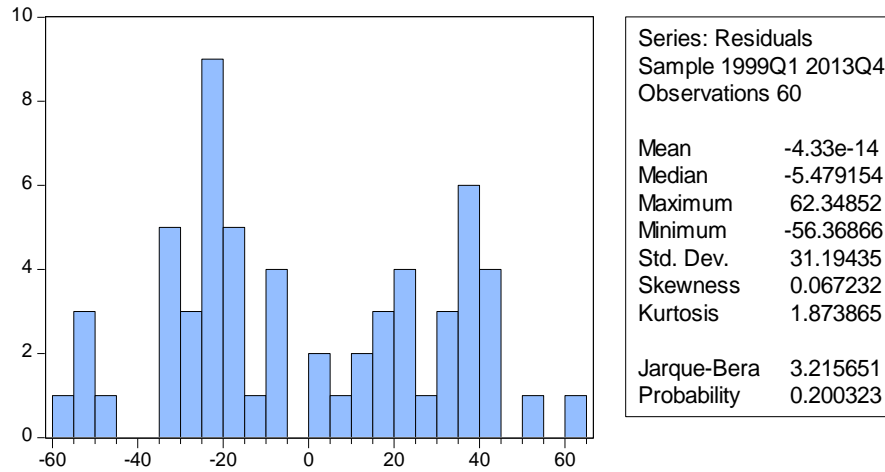
Date: 04/14/15 Time: 07:59

Sample (adjusted): 1999Q2 2013Q4

Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	232.5018	107.3672	2.165482	0.0345
RESID ² (-1)	0.794988	0.083832	9.483140	0.0000
R-squared	0.612060	Mean dependent var		972.6409
Adjusted R-squared	0.605254	S.D. dependent var		901.3979
S.E. of regression	566.3376	Akaike info criterion		15.54957
Sum squared resid	18282081	Schwarz criterion		15.61999
Log likelihood	-456.7123	Hannan-Quinn criter.		15.57706
F-statistic	89.92994	Durbin-Watson stat		1.310470
Prob(F-statistic)	0.000000			

Histogram, Normality Test



The new equation to correct the presence of autocorrelation

Dependent Variable: D(CMIM)
 Method: Least Squares
 Date: 08/12/14 Time: 16:03
 Sample (adjusted): 1999Q3 2013Q4
 Included observations: 58 after adjustments
 Convergence achieved after 7 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-11.41646	3.174607	-3.596181	0.0007
D(GDPP)	0.139786	0.014743	9.481258	0.0000
D(REMIT)	0.000244	4.61E-05	5.282875	0.0000
AR(1)	0.744151	0.090639	8.210017	0.0000
R-squared	0.929311	Mean dependent var		7.740345
Adjusted R-squared	0.925384	S.D. dependent var		18.96069
S.E. of regression	5.179301	Akaike info criterion		6.193690
Sum squared resid	1448.559	Schwarz criterion		6.335789
Log likelihood	-175.6170	Hannan-Quinn criter.		6.249040
F-statistic	236.6359	Durbin-Watson stat		1.854575
Prob(F-statistic)	0.000000			
Inverted AR Roots	.74			

Volatility Transmission between Dow Jones Stock Index and Emerging Bond Index

Amir Saadaoui¹, Younes Boujelbene²

Abstract: In this paper, we use a bivariate GARCH model to estimate simultaneously of the mean and the conditional variance between the Dow Jones stock index and some emerging bond indices. We used the DCC-GARCH model to graphically demonstrate the peaks of the volatility transmission. We examined this transmission using daily returns between July, 30, 2009 and January, 18, 2011 extracted from Datastream. Our results demonstrate that there is a significant transmission of shocks and volatility between the Dow Jones stock index and bond indices of the emerging countries. The results also confirm the idea that the crisis was transmitted from the United States to the emerging countries due to foreign investment made in these countries.

Keywords: volatility transmission; DJ Index; Emerging Bond Index; bivariate GARCH-BEKK

JEL Classification: C8; G1; F3

1. Introduction

The volatility transmission between markets has been the subject of several studies. This transmission can be between different types of markets, such as the stock and bond markets, or between countries, such as the developed and the emerging countries. We can the research of, Karolyi (1995); Caporale et al. (2006); Goeij and Marquering (2004); Baele et al., (2010).

The structure of the correlation between the different classes of assets in competition has a significant role in the strategies of asset allocation and the process of the portfolio diversification. The strategic allocations of limited capital resources among the different asset classes, such as the wider stocks and bonds, may be the most critical in determining investment performance, and financial success decision. The stock and bond markets have historically been substituted to balance the portfolio of assets. In addition, the emerging markets are considered among the most important markets for the allocation of international assets (Harvey, 1995). López-Mejía (1999), Bekaert and Harvey (2003) have shown that there is a large number of

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international capital flows from the developed countries to the emerging bond markets which were brought in to Asia and Latin America during the 1990s debt crisis. In fact, the bond markets of emerging countries have a relatively low correlation with the developed capital markets. Indeed, Bekaert and Harvey (2003) found that the emerging markets have been long marked by a high volatility, a diversification of sources of risk and higher returns than the developed markets. In addition, most of the emerging countries in Eastern Europe, Asia and Latin America have now become more financially sound because of the liberalization of their financial systems and macroeconomic stabilization.

However, several studies, such as, that of Skintzi and Refenes (2006); Cifarelli and Paladino (2006), Lin, Wang, and Gau, (2007) focused on the flow of the stock markets in the emerging countries, but rarely the bond markets. Furthermore, Cai, Jiang and Kumar (2004) showed that the volatility of returns in the bond market is not only important to expect bond yields, but also allows investors to understand the behavior, the source of inter-market volatility transmission for the international diversification, risk management, the valuation of assets and their allocation decisions.

This paper examines the dynamic interrelationships between the Dow Jones stock index and seven emerging bond Indices in terms of return and volatility transmission mechanism. We use the BEKK-GARCH (1, 1) to show the transmission of shocks and volatility asymmetry between the financial markets. We also consider the impact of the global financial crisis on the emerging bond markets and explore the relationship between the US stock market and the bond markets of the selected emerging countries.

This document is divided into five sections covering the above discussion; the first section is the introduction of the research that includes the context and the objectives of the study. The next section discusses the literature review. The data and methods of observation are discussed in Section 3, while the result and the empirical analysis are described and discussed in Section 4. Finally, we end up with a conclusion in which the results are discussed.

2. Literature Review

The correlation between the stock and bond yields has been expressed in a variety of models. Indeed, all the evidence showed that the relationship between these two assets changes over time, especially under the exogenous influence as in crisis. Volatility inducing events, such as the crash of the subprime crisis, is the cause of acute changes in the investor's feeling and allows the transmission of the price differential between stocks and bonds through the domestic and international

markets. Indeed, it is generally recognized that stocks and bonds are complementary and that investors should combine the two different asset classes into portfolios.

Indeed, Barsky (1989), in an earlier study, discussed the interaction between the stock and bond markets using a method based on asset prices. In fact, he analyzed the effects of the risk and real growth changes in economic productivity and their impact on the development of the stock and bond markets. Barsky concluded that the interaction between stocks and bonds can change everything depending on the general behavior of the economic agents. He also posted his paper with an extract of a letter from the Federal Reserve indicating that investors seek to grow and move the shares into relatively safer bonds with falling share prices and rising sovereign bond prices thereafter. In addition, Connolly, Stivers and Sun (2005) showed that instability in the stock markets is an important causal factor in the correlation between stocks and bonds. On the other hand, Baur and Lucey (2010) focused on the correlation between stocks and bonds throughout stress periods.

Alternatively based on general inter-active studies, Fleming, Kirby and Ostdiek (1998) developed a model that predicts the correlation between the stock, bond and money markets. Using a stochastic model, these authors showed that there is a volatility transmission between the various asset classes. In the same context, Lim, Gallo, and Swanson (1998) used both stock and bond indices to test the effect of the long-run causality and the interaction between these two different assets and found a significant relationship between these two markets indices. Indeed, several previous studies used a constant correlation in the context of the analysis of the relationship between stocks and bonds. In contrast, Scruggs and Glabadanidis (2003) used a dynamic approach to study the long-term correlation between a stock index and a portfolio of government bonds. Fang, Lin and Lim (2005) studied the transmission of volatility between the stock and bond markets of Japan and the United States. To measure transmission, they used the GARCH-BEKK model to test the effect of information coming on the market. In some cases, the authors found that there is a bidirectional volatility transmission between markets. Moreover, the results showed that, in domestic markets, the volatility transmission is unidirectional from the stock market to the bond one. This study also showed that transmission among the international stock markets is more important than between the bond ones. Volatility transmission between the two markets indicates that the international diversification of bonds is absent. In the same context of the volatility transmission between the stock and bond markets, Johansson (2010) analyzed this transmission in nine Asian countries. Using a stochastic volatility model with two variables, he found that there are significant effects of volatility transmission between stock and bond markets in several countries. In addition, it was found that the dynamic correlation models show that the relationship between the stock and bond markets changes significantly over time in all countries and that this correlation increases during the turmoil periods in several countries, indicating that there is a contagion

effect between stocks and bonds. Similarly, he showed that the results have direct implications on the behavior of the domestic and international investors in the various asset classes. To explain the transmission of volatility between international equity and bond markets, Christiansen (2008) used a multivariate GARCH model and found that there is a significant effect between the two markets. He also showed that after the introduction of the euro on the European markets, bond markets became more integrated than equity markets. In their article, Kim et al (2006) examined the dynamic correlation between equities and government bonds of some countries during the last decade to infer the state and progress of the integration of financial markets. They found that the patterns of correlations between the stock and bond markets in European countries, Japan and the United States are declining over time. Finally, d'Addona and Kind (2006) used a method of valuation of assets to model the relationship between stocks and bonds. In addition, other studies focused on the dynamic correlation between the assets that belong to the same asset class. The majority of these studies focused on the volatility transmission between assets in time and / or contagion effects between different stock markets. Among these studies we can mention that of Bekaert and Harvey (1995), Bekaert (1995), Forbes and Rigobon (2002) and Johansson and Ljungwall (2009). A limited literature focused on the relationship between international bond markets. For example, Johansson (2008) analyzed the volatility transmission between some emerging Asian bond markets and their dynamic correlation structure. Similarly, other researchers focused on the correlation between the bonds of the developed markets, such as, Skintzi and Refenes (2006) who studied the contagion effect between the US and European markets. Indeed, the study of the interdependence between the volatility in the financial markets has become an important issue for market participants, regulators, and researchers as well as for financial market integration and globalization. This was mentioned by Kim and Rogers (1995), Reyes (2001), Hassan and Malik (2007), and Harju and Hussain (2008).

In the same context, different empirical studies argue that financial crises have a crucial role in the transmission of volatility across financial markets. For example, Schwert (1989a) Caporale et al., (2006), and Tsouma (2007) state that financial crises have an effect on the increase of the stock market volatility. Indeed, Caporale et al., (2006) and Tsouma (2007) showed that the nature of this transmission may vary from one financial market to another in terms of extent and severity of impacts resulting from the recent financial crisis.

3. Data and Methodology

3.1. Data

In this empirical research, we try to analyze the sequence data of descriptive statistics. The goal of our research is to study the volatility transmission between Dow Jones stock Index and Seven Emerging Bond Index. We used daily data extracted from the Datastream database for different indices between July, 30, 2009 and January 18, 2011. These indices are shown respectively as follows: the USA Stock Index, the Dow Jones Index (DJI), for Greece, Greece Bond Index (GECBI); for Hungaria, Hungaria Bond Index (HBI); for Hong Kong, Hong Kong Bond Index (HKBI); for Mexico, Mexico Bond Index (MEXBI); for Poland, Poland Bond Index (POLBI); for Spain, Spain Bond Index (SPBI); and for Turkey, Turkey Bond Index (TRBI). Descriptive statistics for daily returns on the Dow Jones Stock Index and seven Emerging Bond Index are listed in the table below.

Table 1. Descriptive Statistics

	DJI	GECBI	HBI	HKBI	MEXBI	POLBI	SPBI	TRBI
Mean	0.000388	-	3.51E-05	-	-	1.70E-05	3.69E-05	0.000144
Std. Dev	0.018870	0.001088	0.000962	0.000204	0.001621	0.001015	0.002216	0.021538
Skewness	0.242810	1.365851	1.114122	-	-	0.883170	2.846479	5.396648
Kurtosis	4.601720	12.45486	12.28409	0.229078	0.398391	14.54827	37.11711	191.3891
Jarque-Bera	43.42065	1497.241	1412.971	235.8970	32.34277	2115.478	18494.15	551907.4
	0.0000**	0.0000**	0.0000**	0.0000**	0.0000**	0.0000**	0.0000**	0.0000**
	*	*	*	*	*	*	*	*

Notes: Jarque–Bera corresponds to the test statistic for the null hypothesis of normality in the sample return distribution. *** indicates the rejection of the null hypothesis at 1% significance level.

4. Methodology

The first stage of the bivariate GARCH methodology is to present the mean equation. Indeed, this equation for each return series is written as follows:

$$R_{i,t} = \mu_i + \alpha R_{i,t-1} + \varepsilon_{it} \quad (1)$$

Where $R_{i,t}$ is the efficiency of series i between time $t-1$ and t , μ_i the coefficient of long-term drift, and ε_{it} is the error term of the return of series i at time t . Regarding the literature of the ARCH-class models, equation (1) was developed by Engle (1982) to estimate residues and examine the presence of ARCH effects.

We next employ a variant of the bivariate GARCH model which is capable of detecting volatility transmission among different series, as well as the persistence of the volatility within each series. For this purpose, the BEKK parameterization was

used for the bivariate GARCH proposed by Engle and Kroner (1995). The model incorporates quadratic forms in such a way to ensure that the covariance matrix is positive semi-definite, a requirement that is needed so that the estimated variances are non-negative.

The BEKK parameterization for the bivariate GARCH (1,1) model is given by:

$$H_{t+1} = C'C + B'H_tB + A'\varepsilon_t\varepsilon_t' A \tag{2}$$

Where H_{t+1} is the conditional variance matrix. Note that for the bivariate case C is a 2×2 lower triangular matrix with three parameters and B is a 2×2 square matrix of parameters which depicts the extent to which current levels of conditional variances are related to past conditional variances. A is a 2×2 square matrix of parameters and measures the extent to which conditional variances are correlated with past squared errors (i.e., deviations from the mean). The elements of A capture the effects of shocks or events on volatility (conditional variance). For the case at hand, the total number of estimated parameters is eleven.

Expanding the conditional variance for each equation in the bivariate GARCH (1,1) model gives:

$$h_{11,t+1} = c_{11}^2 + b_{11}^2 h_{11,t} + 2b_{11}b_{12}h_{12,t} + b_{21}^2 h_{22,t} + a_{11}^2 \varepsilon_{1,t}^2 + 2a_{11}a_{12}\varepsilon_{1,t}\varepsilon_{2,t} + a_{21}^2 \varepsilon_{2,t}^2 \tag{3}$$

$$h_{22,t+1} = c_{12}^2 + c_{22}^2 + b_{12}^2 h_{11,t} + 2b_{12}b_{22}h_{12,t} + b_{22}^2 h_{22,t} + a_{12}^2 \varepsilon_{1,t}^2 + 2a_{12}a_{22}\varepsilon_{1,t}\varepsilon_{2,t} + a_{22}^2 \varepsilon_{2,t}^2 \tag{4}$$

Eqs (3) and (4) reveal how shocks and volatility are transmitted over time and across the two series under investigation. The following likelihood function is maximized assuming normally distributed errors:

$$L(\theta) = -T \ln(2\pi) - 1/2 \sum_{t=1}^T (\ln|H_t| + \varepsilon_t'H_t^{-1}\varepsilon_t) \tag{5}$$

Where, T is the number of observations and θ the parameter vector to be estimated. Numerical maximization techniques were used to maximize this non-linear log likelihood function. As recommended by Engle and Kroner (1995), several iterations were performed with the simplex algorithm to obtain the initial conditions. The BFGS algorithm was then employed to obtain the final estimate of the variance-covariance matrix and the corresponding standard errors.

5. Result and Discussion

5.1. Volatility Spillover between Dow Jones Standard Index and Emerging Bond Index

Table 2.

Volatility transmission between DJ Index and Emerging Bond Index
 Volatility transmission between DJ Index and Emerging Bond Index

	GRBI	HBI	HKBI	MEXBI	POLBI	SPBI	TRBI
$\alpha (1,1)$	(-0.337850) 0.000000***	(-0.1663336) 0.00185235***	(0.154924653) 0.00041726***	(0.251652) 0.000092***	(-0.256397) 0.000000***	(-0.1242634) 0.016354**	(-0.270097) 0.000000***
$\alpha (1,2)$	(-0.003568) 0.000000***	(0.005305277) 0.07644084*	(-0.002554538) 0.05035175**	(-0.306604) 0.000000***	(0.0053879) 0.0001475***	(-0.0650612) 0.000000***	(-0.2373315) 0.000000***
$\alpha (2,1)$	(-0.992364) 0.27150206	(0.166539156) 0.87023096	(-0.487372677) 0.60649411	(-0.079966) 0.47964372	(0.0002813) 0.99961097	(-0.681466) 0.107882	(-0.6395526) 0.000982***
$\alpha (2,2)$	(1.495320) 0.000000***	(0.611728218) 0.00000000***	(0.343509707) 0.000000***	(1.3550575) 0.000000***	(0.3362423) 0.000000***	(0.7485072) 0.000000***	(4.8358586) 0.000000***
$\beta (1,1)$	(0.557494) 0.000000***	(0.970910628) 0.00000000***	(0.980404389) 0.000000***	(0.940382) 0.000000***	(0.9597433) 0.000000***	(0.9815716) 0.000000***	(0.9459626) 0.000000***
$\beta (1,2)$	(-0.054669) 0.000000***	(0.003154602) 0.00000672***	(0.001338121) 0.00001343***	(0.042131) 0.0023547***	(0.0021708) 0.00007***	(-0.013044) 0.00949***	(-0.0176133) 0.013084***
$\beta (2,1)$	(-0.520145) 0.15163164	(-1.093658414) 0.01150124*	(-0.302274320) 0.33924995	(0.093117) 0.064037*	(-0.0251717) 0.859845	(1.1826475) 0.019748**	(0.1122977) 0.001564***
$\beta (2,2)$	(0.392138) 0.000000***	(0.828751891) 0.00000000***	(0.935432743) 0.000000***	(0.473848) 0.000000***	(0.946824063) 0.000000***	(0.2468647) 0.120741	(0.052254) 0.00112***

Notes: *** indicate significance at level of 1%, ** at level of 5% and * at level of 10%.

The results reported in Table II above show the international influences between stock markets, mainly the Dow Jones and the emerging bond markets to reduce the complications of distribution. We limit our conclusions to 1 percent significance, as suggested by Karolyi (1995), to reduce the biasness that may arise. Overall, the results indicate that the GARCH (1,1) specification satisfactorily captures the continuing series of back to square. The conditional variance in each market is significantly affected both negatively and positively by its own past innovations from α_{11} with values between [-0.337850, 0.251652], while the dependence of the cross-market volatility varies according to the magnitude of the country. Indeed, the level of constancy in volatility is expressed by coefficient β_{11} . The different estimated coefficients for index β_{11} included in the range are in the interval of [0.557494, 0.9815716]. This recommendation of market volatility is a measure of persistence in both stock and bond indices.

Let's turn to the explanation of the volatility transmission between the stock index and Dow Jones of the emerging bond indices. The above table shows that the average volatility transmission between these two types of indices is significant at 1% level for most of the indices. The estimated α_{12} and β_{12} coefficients represent the average transmission of volatility and the variance of the Dow Jones to the emerging bond markets. The volatility transmission appeared significant at 1% in most of our sample. This explains well the sovereign debt crisis that some European emerging countries, such as Greece and Spain had. This explains well the negative impact of the transmission in means and in variance for both countries. For Greece, the

transmission in average and in variance is represented by α_{12} (-0.003568) and β_{12} (-0.054669). Similarly, the negative effect for Spain, which appeared in average and in variance is represented by α_{12} (-0.0650612) and β_{12} (-0.013044).

Indeed, the transmission also appeared in other countries in average and in variance, we can mention for example, Hong Kong α_{12} (-0.0650612) and β_{12} (-0.013044), Mexico α_{12} (-0.0650612) and β_{12} (-0.013044) Turkey and α_{12} (-0.0650612) and β_{12} (-0.013044). These results show the significant effect of the subprime crisis on all countries whether developed or emerging. Furthermore, this recommendation may be explained by the unidirectional transmission in average and in variance.

5.2. Dynamic Conditional Correlation between Dow Jones Index and Dow Jones Islamic Index

To assess the progress of the correlations between the Dow Jones standard index and the emerging bond index over time, we report in Fig.1, the dynamic conditional correlation between both types of assets. The correlation between the indices during the periods of financial stress is clearly marked. At first, the correlation is greatly volatile during the crisis period which is really seen in most of the figures below. In most cases, there is a rise in volatility during the crisis. We can say that, generally, the subprime crisis caused significant changes in the consistency of Dow Jones Standard Index and Emerging Bond indexes, as well as a higher correlation in volatility. From the results, we can conclude that the correlation tends to rise during the crisis and which increased the links between Dow Jones index and emerging bond indexes.

In general, our results show that the subprime crisis played a key role in developing the relationship between Dow Jones index and the emerging bond Indexes. Indeed, the topmost correlations between both types of indices are usually observed during the financial crisis, which represent the phenomenon of stock market financialization. The results explain the volatility transmission from Dow Jones stock index to the emerging bond index, this is noticed mainly for Greece and Spain which had a severe liquidity crisis in the mid-2010.

6. Conclusion

There are different theories about how the stock and bond markets should be related to each other. This paper examines the links between the Dow Jones Stock Index and seven emerging Bond Index. We first use the bivariate BEKK-GARCH model of Engle and Kroner (1995) to demonstrate the correlation between these indices. Then, based on the DCC-GARCH, we graphically show if the correlations between the indexes change over time, especially in the crisis period.

The great discovery can be summarized as follows: in a panel of seven Bond Indexes over the period from July 30, 2009 - January 18, 2011, we found that the correlation between the different Emerging Bond Indexes and Dow Jones Standard Index through time, was highly volatile during the 2007-2008 financial crises. While the stock market collapse has disentangled the links between the two types of Indexes on the very short run, the greatest correlations are observed during the financial crisis showing increased links between the Stock and Bond Indexes. On the whole, our detections show that the subprime crisis played a key role in showing the links between the Dow Jones stock Index and the Emerging Bond Indexes. The results show the effect of the subprime crisis which emerged in the United States, mainly on Greece and Spain which have had experienced a sovereign debt crisis since the mid-2010.

7. References

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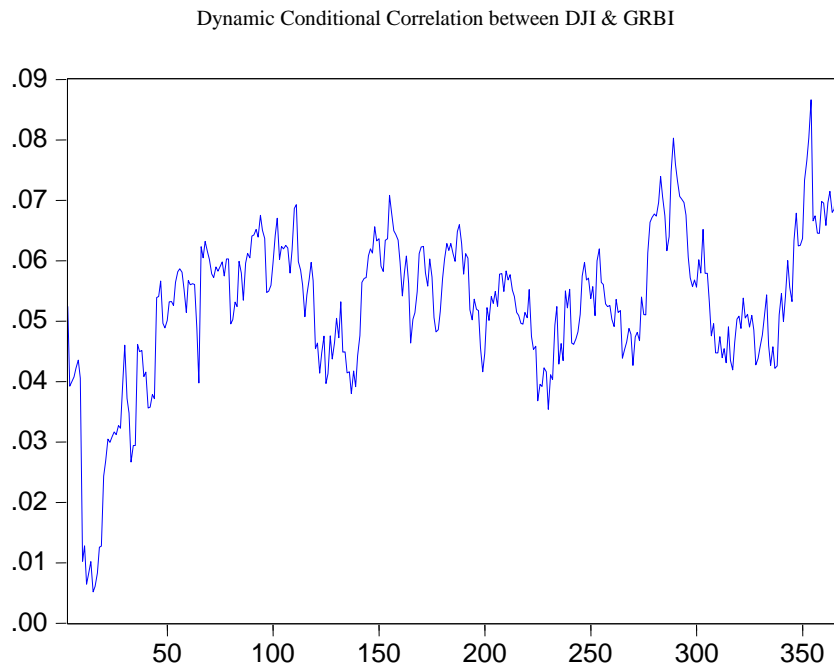
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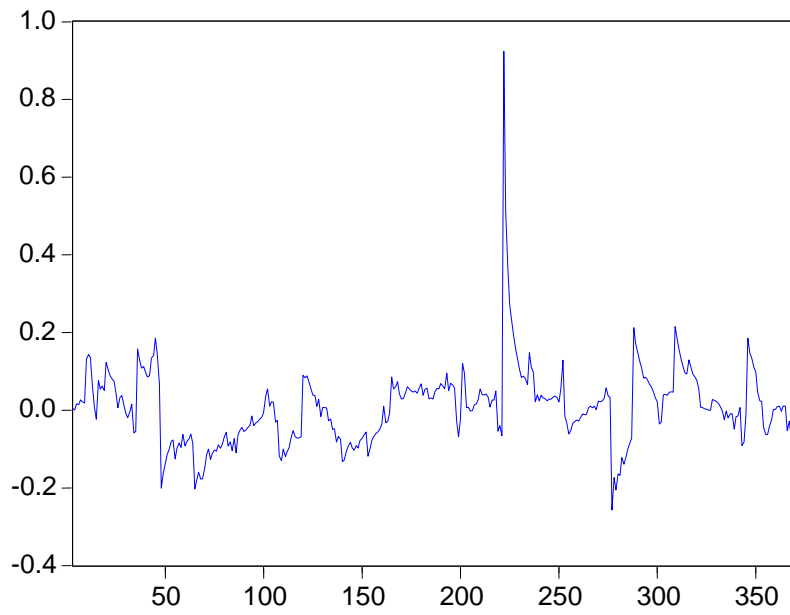
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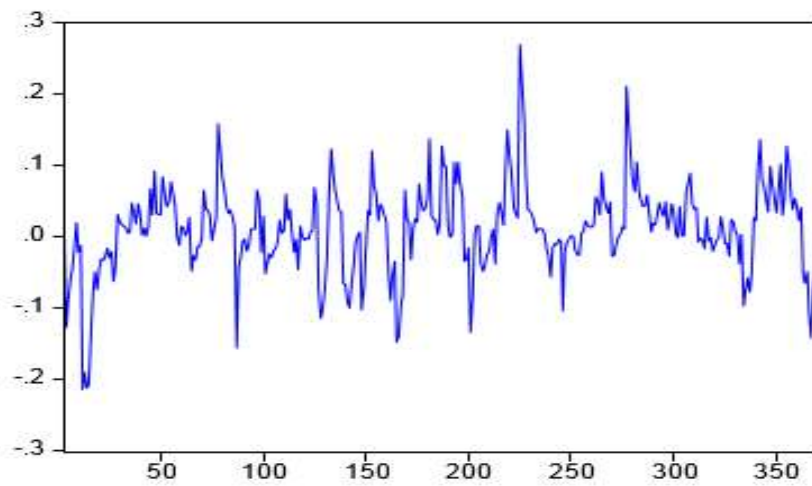
Figure 1. Conditional Correlation between DJI & EBI

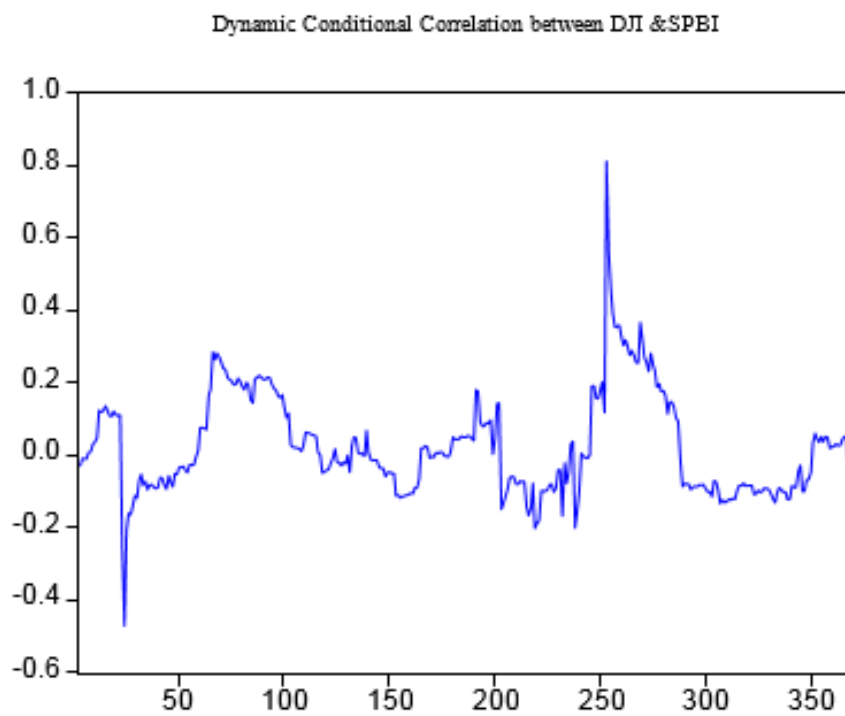
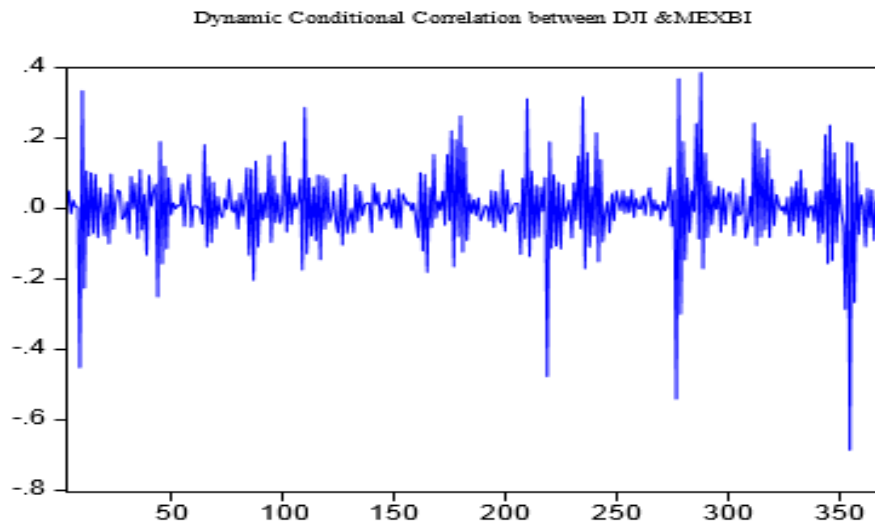


Dynamic Conditional Correlation between DJI & HBI

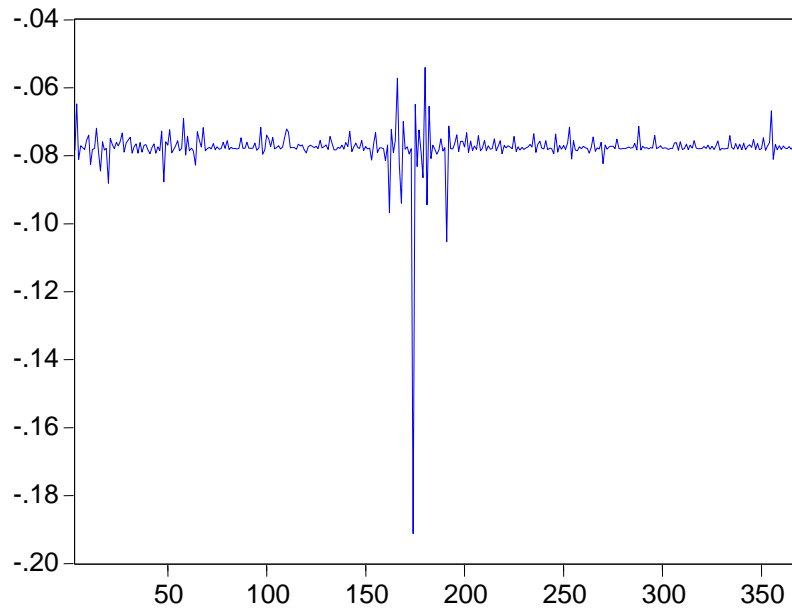


Dynamic Conditional Correlation between DJI & HKBI





Dynamic Conditional Correlation between DJI & SPBI



Impact of SNB Decision to Unpeg the Franc from Euro on Financial Markets: Event Study Approach

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Abstract: The aim of this paper is to study the impact of Swiss National Bank (SNB) decision to unpeg the franc from euro, which was taken on 15th January, 2015, on main financial markets around the world. Our results shows that the stocks market reacted significantly in the event day (except stock market from Asia & Australia), when was recorded a significant decrease of 0.33% in the average return. Moreover, it seems that after 4 days there was recorded the highest significant decrease of global market return of 1.3%.

Keywords: event study; exchange rates; stock markets; Swiss franc

JEL Classification: G14, E44

1. Introduction

In our days things are happening very fast. Sometimes nature takes us by surprise and hurricanes, earthquakes, floods and other similar can cause a lot of losses, not only human losses but also financial one. Despite this, there are events caused by man, which are affecting the stock prices of different companies. Sometimes the effect is positive and it is causing an increase in stock price (announcement of dividend payment, profit realization, and others similar events) or contrary a decrease in stock price (theorist attack, losses realization, change company management, and others similar events).

Because of this, many researchers were interested in finding the exactly manner in which a stock price of a company is affected by different kind of event, to be able in the end to classify the events in two categories, as we mentioned before (events which cause an increase in stock prices and events which cause a decrease in stock prices).

Swiss National Bank, on January 15th, 2015, took the decision to unpeg the franc

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from euro. So based on this decision, the CHF started to appreciate with a significant values compared to EUR and USD in a very short period.

Through this paper we want to analyse more detailed the impact of SNB decision on main stock markets around the world, based on event study methodology.

The paper is organized as follows: in the first section we present the main types of events for which it can be applied the event study methodology, in the second section we present the methodology used, in the third section we present the main data, the fourth section highlights the main results, and the last section concludes the paper.

2. Literature Review

Some researcher tried to understand the economic and financial implication of a natural disaster: earthquakes, floods, cyclones, and bushfires. As it is emphasized in the literature, these events might cause shutting down activities not only in the affected area, but also in other far area. Going further, sometimes these disasters can be a boosting factors for economy. The history proved us that big hurricanes such as hurricane Camille from 1969, hurricane Hugo from 1989 or hurricane Andrew from 1992 determined an outperforming of companies from construction industry (Tara Denise Barton, 2005).

In the same time, it seems that bushfires, cyclones and earthquakes have a major effect on market returns, unlike severe storms and floods (Worthington and Valadkhani, 2004). The devastating attack against United States on September 11th, 2001, by hijacking four planes of two big American Airline Company had a great impact on financial markets and especially on the stock prices of airlines companies. Kilroy (2001) stated that, the most affected by the terrorist attack were the airline and travel industries, due to fact that United States commercial passenger traffic was dropping nearly 40% between September 10th and October 10th 2001.

Going further, Korolyi and Martell (2005) emphasize that the attacks in countries wealthier and more democratic, are associated with larger negative share price reaction. Mergers and acquisitions have been for a long period of time considered major events in a firm's life. Acquisitions are a well-recognized method for rapidly capturing desirable resources and establishing a greater degree of control over one's environment (Barney, 1988) Another important finding is that acquirers at best break even in terms of stock market reactions, with target shareholders expropriating the majority of the abnormal returns.

In order to focus more on our topic research, we search in literature the main papers which analysed the impact of different kind of regulation on stock price evolution. Regarding this, one of the most analysed regulations is represented by Securities Acts from 1933 ad 1934, as is stated by Beardsley and O'Brian (2003), and based on

the previous research the disclosure requirements imposed by the Act didn't have an impact upon mean returns. Another regulation analysed by researchers was represented by the Regulation FD (Fair Disclosure) adopted by U.S. Securities and Exchange Commission (SEC) on August 15th, to address the selective disclosure of information by publicly traded companies. Regarding this topic, Heflin et al. (2003) was interested in finding if stock return volatility has been influenced by adoption of this new rule. Through their paper, they showed that adoption of regulation FD didn't increase return volatility, so the alarms which were raised by financial market were not founded. SNB decision from January 15th, 2015, it is very important because affects the most important financial markets. Therefore, through this paper we want to analyse empirically the effect caused by this decision, on the main stock markets around the world. Through this paper we want to analyse more detailed the impact of SNB decision on main stock markets around the world, based on event study methodology.

3. Methodology

Our methodology used to find the impact of the SNB decision from January 15th, 2015 to unpeg the franc from euro, on the main stock markets around the world, is represented by the event study methodology, due to fact that the timing of this decision was not predictable. This type of methodology is extensively used in the literature to highlight the impact of a variety of events, such as: mergers, dividend announcement, antitrust actions, announcements of accounting rule changes, investor reactions to major catastrophes, and for evaluating the equity impacts of regulatory reform in the transportation industries, as pointed out by Bruning and Kuzma (1989).

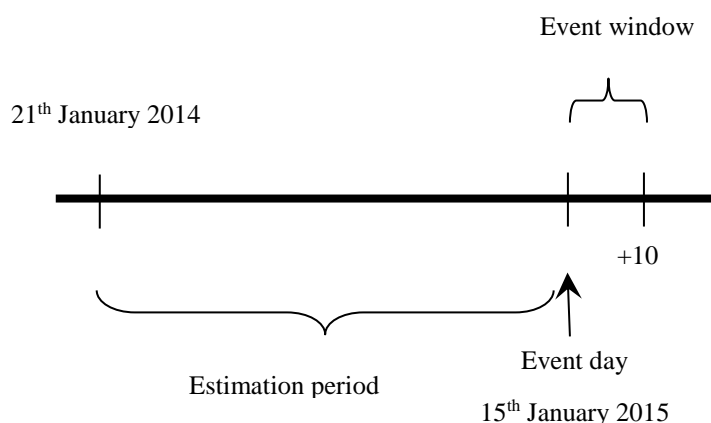


Figure 1. Estimation period and event period

In our case the event day named day “0” is January 15th, 2015. For each index we used a maximum of 250 daily returns for estimation period, as it is highlighted by the previous studies that a value of 250 days is corresponding to the number of trading days in a year (Corrado, 2011; Brown and Warner, 1984).

In figure 1 we are able to see the estimation period of 250 days (-250 through -1) and the event period of 11 days (0 through +10). In our study we compute the daily return based on formula (1).

$$R_t = \log\left(\frac{P_t}{P_{t-1}}\right), \quad t = -249, -239, -238, \dots, +8, +9, +10 \quad (1)$$

where R_t - return at time t , P_t - price at moment t and P_{t-1} - price at time $t-1$.

Due to fact that the decision took by SNB on January 15th, 2015 to unpeg the franc from euro, highly affected the exchange rates, we would expect R_t to react significantly.

The value of R_t can be expressed in two manners: R_t as normal/expected return and R_t as abnormal return. The expected return is computed based on market model, using the regression presented in formula (2):

$$E(R_t) = \alpha + \beta \times R_{M_t}, \quad t = 0, +1, +2, \dots, +8, +9, +10 \quad (2)$$

where α and β are obtained by estimating the regression between the return of each index and the global market return, based on formula (3):

$$R_t = \alpha + \beta \times R_{M_t}, \quad t = -250, -238, -237, \dots, -3, -2, -1 \quad (3)$$

The R_{M_t} is the return of the global market at moment t , and usually it is estimated as the return on a broad-based market index. In our case we will use a global market index namely STOXX Global Total Market Index (TMI), which represents 95 percent of the free float market capitalization worldwide.

The next step in our analysis is to compute the abnormal (unexpected) return defined as the difference between the real return and expected return.

$$Ab_t = R_t - E(R_t), \quad t = 0, +1, +2, \dots, +8, +9, +10 \quad (4)$$

Despite this, there is another useful statistic – Cumulative Abnormal Return (CAR), being helpful in indicating a pattern in which the price index reacts to the event. This indicator is estimated according to formula (5):

$$CAR_t = \sum_{k=-10}^t Ab_k, \quad (5)$$

First tested aspect was to find if there was significant average abnormal return

recording on stock markets as reaction to the SNB decision. More exactly, using a two-tailed t-test, we check if the average abnormal return of each main stock market for the day i , ($i = 0$ to $+10$) is statistically significant different by 0, based on the hypothesis from relation (6):

$$\begin{aligned} H_0 : \overline{Ab}_i &= 0; \\ H_1 : \overline{Ab}_i &\neq 0. \end{aligned} \quad (6)$$

4. Data Collection and Descriptive Statistics

In the analysis we included the most important stock markets from the world: stock market from North America, stock market from Europe and stock market from Asia, in order to check the effect of SNB decision to unpeg the franc from euro on these three important markets. The indices selected from each market and the data sources are presented in table 1.

All indices values were denominated in EUR, based on the exchange rates available on European Central Bank.

Table 2. Data Source

Market	Index	Currency	Data source - link
North America	S&P 500	USD	http://finance.yahoo.com/stock-center/
	NYSE Composite	USD	
	NASDAQ Composite	USD	
	DJIA	USD	
	AMEX Composite	USD	
Europe	FTSE 100	GBP	http://finance.yahoo.com/stock-center/
	CAC40	EUR	
	DAX	EUR	
	EURONEXT BEL-20	EUR	
	ATX	EUR	
Asia & Australia	NIKKEI 225	JPY	http://finance.yahoo.com/stock-center/
	HSI	HKD	
	AORD – Australian Index	AUD	
	BSESN (Bombay)	INR	
	NZX 50	NZD	
Global	TW1P	EUR	http://www.stoxx.com/indices/types/benchmark.html
Exchange rates	AUD/EUR	-	https://www.ecb.europa.eu/stats/exchange/eurofxref/html/index.en.html
	EUR/CHF	-	
	EUR/GBP	-	
	EUR/USD	-	

HKD/EUR	-
IDR/EUR	-
INR/EUR	-
JPY/EUR	-

Descriptive statistics of daily returns computed after I denominated the values for all indices in EUR, expressed in percentages are presented in table 2. All financial indices, except ATX index and FTSE100, have a positive average return for the analysed period. Going further, we are able to see that stock market from North America has a higher return compared to the stock market from Europe and Asia. Regarding this, the stock market from North America recorded an average return of 0.11%, while the stock market from Europe recorded an average return of 0.02%, and stock market from Asia (excluding BSESN index) recorded an average return of 0.09%.

Another interesting fact is represented by the values for skewness, because the stock market from Europe record a negative value of this statistical measure, which inform us that in the analysed period, the majority daily returns recorded on the market were higher than the average, while in case of American and Asian market we have the opposite, so the majority daily return for the analysed period were less than average.

Table 2 Descriptive statistics

	Variable	Mean	Median	Max.	Min.	St. dev.	Skewness	Kurtosis
North America	AMEX	0.0010	0.0008	0.0387	-0.0324	0.0095	0.03	4.99
	DJIA	0.0012	0.0010	0.0372	-0.0292	0.0087	0.15	4.94
	NASDAQ	0.0013	0.0014	0.0384	-0.0368	0.0102	-0.09	4.53
	NYSE	0.0010	0.0008	0.0345	-0.0317	0.0085	0.14	5.11
	SP500	0.0013	0.0012	0.0369	-0.0302	0.0088	0.10	5.08
Europe	ATX	-0.0006	0.0000	0.0281	-0.0439	0.0108	-0.58	4.29
	CAC40	0.0005	0.0010	0.0352	-0.0370	0.0109	-0.14	4.06
	DAX	0.0006	0.0009	0.0330	-0.0350	0.0112	-0.14	3.61
	EURONEXT	0.0009	0.0009	0.0341	-0.0337	0.0088	-0.09	4.86
	FTSE100	-0.0003	-0.001	0.0275	-0.0272	0.0083	-0.10	3.87
Asia & Australia	AORD	0.0005	0.0009	0.0234	-0.0277	0.0093	-0.14	3.22
	BSESN	0.0022	0.0016	0.0472	-0.0405	0.0115	0.16	5.27
	HSI	0.0012	0.0015	0.0480	-0.0328	0.0101	0.14	4.66
	NIKKEI225	0.0009	0.0009	0.0446	-0.0371	0.0113	0.05	4.46

NZX50	0.0009	0.0006	0.0255	-0.0318	0.0074	-0.05	4.50
TW1P	0.0010	0.0009	0.0282	-0.0193	0.0071	0.32	4.17

5. Results

The first step, before applying the event study methodology, it is to check if all the time series are stationary. Based on Augmented Dickey-Fuller test, we obtained that all series are stationary at 1% significance level.

Second step is to estimate the regression model between each index's return and global market return, which are used to compute the expected return during the event window. Based on expected returns and real return we compute the abnormal return for each day from the window period for each single index. After that we will test if the average abnormal return for each market and the total market is different by 0. The results for two side t-test are presented in table 3.

At a first glance we can see that in the day of the event, there is recorded a negative abnormal return for all groups, except Asia and Australia, for which a negative abnormal return it is recorded on the day 1. This it is easy to explain, to do the local time zone.

Despite this, we are able to see that after 3-4 day, all financial markets around the world have encountered some highly significant abnormal return, which means that the impact of this decision, started to cause some more important effects. As we know, there were several cases in which hedge-funds were closed – the case of Everest Capital LLC's Global which had \$830 million in assets, or other situations in which the funds suffered significant losses: Discovery Capital Management LLC, (the firm manages \$14.7 billion), and Comac Capital LLP (the firm manages \$1.2 billion), as it is stated by Copeland (2015).

Table 3. Statistical significance testing for abnormal returns

Event day	Global market		North America		Europe		Asia & Australia	
	\overline{Ab}	<i>t</i> -test	\overline{Ab}	<i>t</i> -test	\overline{Ab}	<i>t</i> -test	\overline{Ab}	<i>t</i> -test
0	-0.0033	-0.236	-0.0171	-4.619***	-0.0005	-0.217	0.0148	3.632**
1	0.0005	-0.067	0.0096	9.846***	-0.0033	-1.687	-0.0067	-3.474**
2	0.0058	2.99***	0.0025	2.44*	0.0128	11.127***	0.0055	0.868
3	0.0017	1.533	-0.0021	-1.706	0.0054	1.603	0.0044	1.478
4	-0.0129	-10.61***	-0.0132	-12.55***	-0.0106	-7.959***	-0.0169	-5.55***
5	0.0257	5.802***	0.0327	17.6***	0.0077	1.089	0.0373	6.925***
6	-0.0121	-7.781***	-0.0168	-9.005***	-0.0062	-3.752**	-0.0123	-6.437***
7	0.0037	2.578**	-0.0006	-0.162	0.0062	4.905***	0.0117	2.744*
8	-0.0013	-1.011	-0.0138	-8.617***	0.0037	1.086	0.0024	0.853
9	-0.0004	-0.45	0.0102	7.57***	0.0001	0.071	-0.0146	-2.838**
10	-0.0070	-3.417***	-0.0115	-8.997***	-0.0046	-1.777	-0.0033	-0.749

***, **, * - the null hypothesis is rejected at 1%, 5%, respectively 10% significance level

Going further, we wanted to see if there was some arbitrage opportunity due to this unexpected event between the exchange market from US and the exchange market from EU.

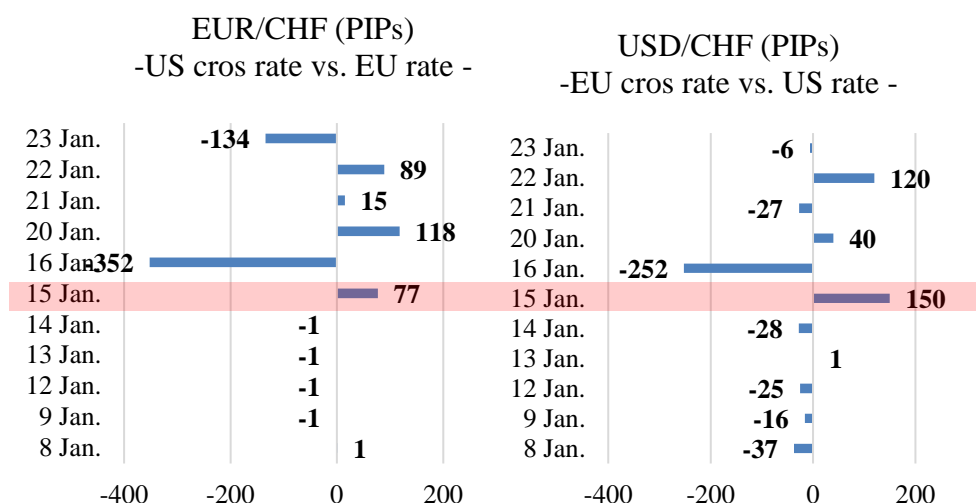


Figure 2. Calculated differences in PIPs between the cross rate and official rate

In figure 2, we presented the difference between the official exchange rate from UE/US and the calculated cross rate from the other country US/EU, for both exchange rates EUR/CHF and USD/CHF, for five days before the event and five days after the event. We are able to see that in the week before the event there are very small differences between the official exchange rate from a country and the corresponding cross rate calculated in the other country. In the case of EUR/CHF there is a difference of only 1 PIP between the exchange rates, while in case for USD/CHF there is a difference of around 1 – 37 PIPs. This mean that there is no opportunity for arbitrage.

Going further, in the week after 15th January, there are recorded much higher differences between the exchange rates. This is a signal that there was some opportunity for arbitrage in the market. In the same time, this differences highlight that there was a general uncertainty regarding the evolution of the exchange rate for CHF, due to fact that many financial institution, as I mentioned above recorded big loses after the decision were applied, and in a some way it was created a mini effect of domino.

6. Conclusion

Through this paper we wanted to point out that the SNB decision from January 15th, to unpeg the franc from euro had a significant impact on main financial markets. In order to achieve this, we selected five stock indices from the stock market from North America, stock market from Europe and stock market from Asia.

The methodology used in our paper in order to highlight the impact of the SNB decision, on the main stock markets is represented by the event study methodology. The reasoning to use this is because the timing of this decision was not predictable, as it is pointed in the literature (Bruning and Kuzma, 1989).

Our results pointed out the fact that in the event day, there is recorded a negative impact on all stock market except Asia and Australia, for which a negative abnormal return it is recorded on the day 1. Moreover, the effect of unpeg the CHF from EUR had felt more strongly after 3-4 days after the event day, result supported by the real facts, because several hedge funds suffered huge losses after few days from the decision approval (Everest Capital LLC's Global, Discovery Capital Management LLC, and Comac Capital LLP).

We were able to see that even if before the event day, there were not big differences between the official exchange rate from a EU / US and the corresponding cross rate calculated in the other country, in the week after the event, there are recorded much higher differences between the exchange rates.

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