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RESEARCH ARTICLE

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## IMPACT OF REMITTANCES ON FINANCIAL DEVELOPMENT IN SOUTH ASIA

Syed Jawad Hussain SHAHZAD\*, Noureen ADNAN\*\*,  
Sajid ALI\*\*\*, Naveed RAZA\*\*\*\*

**Abstract:** *Remittance inflows have been recorded as the second major external source of finance after foreign direct investment (FDI) for emerging economies. This paper empirically examines the impact of remittance inflows on financial sector development in South Asia using data from 1989 to 2011. We have constructed a financial development index through Principle Component Analysis (PCA) using eight main indicators of financial development from banking, stock and insurance sectors. Pooled Ordinary Least Square (OLS) estimation indicates that remittances inflows have positive and significant impact on financial sector development. Further, Generalized Method of Moments (GMM) system estimation to cater endogeneity biases (resulting from reverse causality) is applied. Findings confirm a significant positive impact of remittances on the financial sector development. Factors that drive financial development have a differential impact in South Asia. Specifically, economic growth and Foreign Direct Investment (FDI) enhance financial development. Inflation and exports are to deteriorate financial development in the region. These results are robust under different model specifications. This study is of importance for the South Asian countries to properly formulate policies and channelize these increasing inflows so that it can foster financial development.*

**Keywords:** *Remittance inflows, financial development, economic growth, South Asia*

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## 1 INTRODUCTION

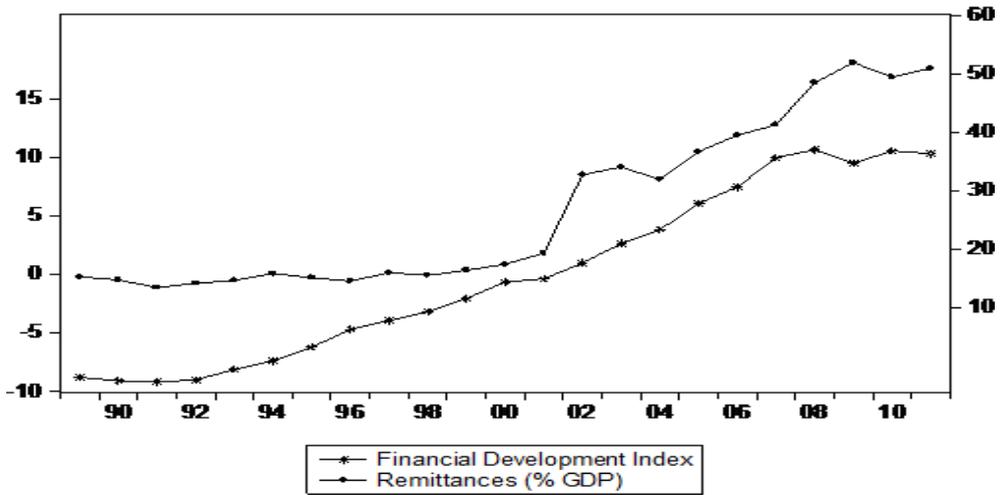
Remittance inflows have been recorded as the second major source of external finance for emerging economies after foreign direct investment (FDI). Increase in inflow of remittances may help in coping against many problems like increase in foreign reserves, managing current account deficit, stabilizing exchange rate and reduction in poverty etc. Remittance inflows in comparison to private capital flows are likely to remain steady. These flows also rise during the periods of natural disasters and economic recessions (Yang, 2008). Furthermore, a country's competitiveness can be corroded by heave in inflows like aid inflows but remittance inflows do not have this poor effect (Rajan and Subramanian, 2005). Remittance inflows have doubled than the sum of official development assistance received, both in the form of absolute terms and in terms of percentage of GDP (Levine, Loayza and Beck, 2007). Moreover, some researches argue that the development impact of remittance inflows is multiplied with the help of banking remittance recipients (Terry and Wilson 2005; Hinojosa-Ojeda, 2003; and World Bank, 2006). This heave in size and the steadiness of remittances inspired many researchers to look into the outcome of remittances on numerous issues like poverty alleviation, economic growth, inequality, education, entrepreneur-ship along and infant mortality.

Whether remittance inflows lead to financial sector development and how they affect financial sector development is priori not very clear because of the view that the remittance inflows might be acting as a supplement for banking sector development in the developing economies. Transfer of money can floor the ground for recipients for not only demanding but also getting the access to the financial products and services that they may not be getting otherwise (Orozco and Millis, 2007). Simultaneously, providing services related to remittance transfer makes the banks to "become acquainted with" and attain out to unbanked receivers or beneficiaries with inadequate financial intermediation. Conversely, the level of credit in the financial system of an economy can increase if banks' loan-able funds poured in as a consequence of deposits associated with remittance transfers. Which eventually helps in overcoming the difficulty of liquidity restraints in the economies with underdeveloped financial structures by providing an optional method to sponsor investments. Besides, due to the uncertain conditions like reduction in the average age level and lumpy remittances, dependents/receivers

might be in a need of such financial products that permits the safe storage of these funds eventually inspiring their dependents to invest their surplus money with the insurance companies to shelter their future expectations. Moreover, the sum received by the beneficiaries may be invested in the stock market as the transmittal inflows can aid in trouncing the dilemma of liquidity constraints in the economies with less developed financial systems (Giuliano and Ruiz-Arranz, 2009).

A significant problem in empirically examining the association between remittance inflows and financial sector development is the presence of endogeneity as a consequence of reverse causation. Reverse causality is a severe problem when studying the relationship between the remittance inflows and financial sector development. Higher development in financial sector may cause in measuring the larger remittances either due to development of financial sector or remitted through formal channels. Furthermore, expansion in financial sector development may also decrease the cost of remitting the remittances leading to increase in remittance inflows which eventually gives the biased results in measuring the impact of remittance inflows on financial sector development.

Though, the studies have already proposed that remittance inflows exert significant positive impact on financial sector development, further studies are still needed so that the relationship between remittances and financial development could be understood (Aggarwal et al., 2011). The relationship is also important to understand how financial development causes growth and reduce poverty. Moreover, the question is of great significance because it is believed that the remittances are mostly used for the purposes of consumption. So, they might have no or nominal impact on financial development. Finally, the previous studies have investigated the impact of remittance inflows on financial development by considering only the banking development indicators. Therefore, we have first constructed a PCA based financial development index from eight banking, stock market and insurance companies' indicators. Then, GMM estimation that deals with the issue of endogeneity is applied to establish a link between workers' remittances and financial development in South Asia over period 1989 to 2011. To the best of our knowledge, this study is the first attempt to establish a link between remittances and financial development by using banking, equity and insurance sectors indicators in an under developed region of South Asia.



*Figure 1* Remittances and Financial Development, 1989–2011.  
Sum of South Asian Countries

*Source:* IMF and author's calculations

The rest of the paper comprises of four sections. Section 2 reviews all the seminal and recent research endeavors systematically which are pertinent to the area covered by this study. Section 3 explains the variables being analyzed in this study along with their proxies. It also discusses the sampling details, data sources, and econometric techniques that are used for estimation. Section 4 presents findings with the context and tries to answer the research question of the study. Section 5 summarizes the findings and suggests policy implications based on results.

## 2 LITERATURE REVIEW

As the remittances increased, the importance of remittance inflows also increased which ultimately enthused many of the researchers to conduct different studies in different dimensions. These may include the impact of remittance inflows on economic growth, exchange rate, poverty alleviation, education, inequality, entrepreneur-ship, health and infant mortality. Javid et al. (2012) found that remittances play effective role in eradication of poverty in developing countries like Pakistan. The remittances from workers working abroad are instrumental in elimination of poverty. Adams et al. (2008) while observing the case of Ghana realized that domestic and foreign remittances reduce the intensity and depth of poverty. Edwards and Ureta (2003) found that remittances also have

an effect on school retention. Frank (2005) believes that the migration to other countries has a good impact on health of infants that happens in the context of significant loss of social support and increasing levels of stress. Improvements in social and economic factors caused by the arrival of remittances are important factors that contribute to this effect.

Keeping in mind the greater importance of these increasing inflows, researchers have studied the impact of remittances on economic growth. In order to examine how economic growth is impacted by the remittances within the neoclassical framework, Fayissa et al., (2010) using data from year 1980-2004 of 37 African countries found that the remittances exert positive effect on economic growth in countries whose financial systems are less developed. The study shows that common growth sources. Knowledge and ability of spending on health, housing, nutrition, and other household items can increase their productivity and can play vital role in economic growth. African countries can have economic stability by investing in traditional sources like human, physical capital, FDI as well as by using the remittances in best possible way by ensuring effective transfers and bringing down the cost (Fayissa et al., 2010). Similar findings have been presented by Javid et al. (2012) and Iqbal and Sattar (2010) among others. For the purpose of understanding the relationship between remittance inflows and growth, one has to take into account how development of the local financial sector affects the ability of a country to take advantage from these inflows.

It is observed that some countries especially the less developed countries are using these remittances for investment purposes. In Mexico about twenty percent of the total capital invested in the businesses is remitted by the workers' residing and working in the United States (Woodruff and Zenteno, 2001). Same is the case in Egypt where migrants after returning to their home used the funds earned abroad to establish their own enterprises (McCormick and Wahba, 2003). Oke et al. (2011) investigated the association between remittance inflows and the financial sector development by using data on Nigeria from year 1977 to 2009. The study applied ordinary least square (OLS) and generalized method of moments (GMM) estimation techniques. The ratio of private credit to GDP and the ratio of money supply to GDP were the two indicators which were used to measure the financial development. It was found that remittance inflows have positive effect on financial development with the exception of the ratio of private credit to GDP. In Nigeria's

remittances increase liquidity more as compared to loanable funds as remittances are mostly used for consumption purposes rather than productive purposes in the economy. As, these inflows are source of foreign exchange which is very vital to the internal as well as the external sectors of the economy, therefore, they should be supported by formulating and implementing a suitable policy. In a similar country specific study, Chowdhury (2011) examined how financial sector development is impacted by remittance inflows in Bangladesh. After applying co-integration analysis and vector error correction model on data from year 1971 to 2008, it was concluded that the development of financial system of Bangladesh is positively impacted by the increase in remittances inflows. The estimation results also show that the remittance inflows are not dependent on financial sector's development of the economy. It seems that the recipient countries have generally remained unable to manage and use the remittances efficiently because the impact of remittances varies from country to country as they are the private transfers and the market forces alone cannot make their use productive that leads to financial sector development and ultimately cause growth in the economy. For that matter, some appropriate policies are also needed to be taken by the government so that the remittances could be used more efficiently (Nicholas, 2002). What could be meant by efficient use here is that if the remittances are channelized properly then the deposits of the banks may increase which then can be used to overcome the problems of liquidity and hence the level of investments in the country would increase ultimately fostering financial development in the region.

Studies to examine the remittance-financial development link are also conducted on the regional basis using different panel sets. Gupta et al. (2009) examined the impact of increasing inflow of remittances to sub-Saharan Africa. Although this region gets a very small amount of remittances as compared with other developing economies and much of the funds are in form of aid but it is found that the financial sector development is impacted positively by increase in remittance inflows. This positive impact also helps in reduction of poverty in the region. Same results were found even after controlling the reverse causality among remittances, financial development and the poverty. It has been suggested by the study that if properly utilized the remittances can help as access point for unbanked individuals and households. The greater increase in remittance inflows encouraged Fayissa et al. (2012) to observe the long-run association between these

inflows and financial sector development taking into account 44 countries including 25 from Africa and 19 from America for the period 1985 to 2007. This relationship was investigated by taking into account exchange rate, domestic per capita income of receiving country, the size of migrant stock and the foreign per capita income in the host country. They concluded that financial development, exchange rate stability, and the size of migrant stock on both of the regions are affected positively by remittances. The study also recognizes the effect of determinants of remittances which depends on regional differences.

Aggarwal et al. (2011) collected a data of around 109 developing countries for the period of 1975 to 2007 to examine the link between the cumulative deposits' level and remittance inflows and also between credits issued by the local banking sector and remittance inflows. The Fixed Effects Model and GMM dynamic system suggested that financial sector development is positively impacted by remittance inflows and also they are interrelated. Giuliano and Ruiz-Arranz (2009) also analyzed the impact of remittances on financial development by using a data of 100 developing countries. He found that remittances have much prominent effect in less developed financial systems as compared with well managed systems and help in overcoming the liquidity constraints and provide an alternative investment source. This implies that in the presence of proper channels for remittance transfers can increase in remittance inflows ultimately causing financial sector development. Increase in bank deposits increases the ratio of credit to GDP in these countries. Aggarwal et. al (2006) applied fixed effects model on data of 8 countries from 1870 to 1913 and it was suggested that there is more-than-proportional impact on the financial services penetration. Other international inflows have less-than-proportional effect. The association between remittance inflows and financial sector development on both macro as well as micro level was first examined by Brown et al. (2011). While analyzing the macro level, data of 138 countries from 1970 to 2005 is used to estimate fixed effects and probit model. At the micro level dataset contained 3,899 and 3995 households from Azerbaijan and Kyrgyzstan, respectively. They found that remittances and financial development are inversely related in Azerbaijan while a direct relationship was found in Kyrgyzstan but its effect was less prominent.

Although the importance of remittances for social wellbeing in host countries is well document, historical literature does not provide a conclusive end

to the debate of remittance-financial development linkages. It is also evident that contribution of workers' remittances toward financial development depends on the regions as well as the efficient use and channelizing of inflows. Previous empirical mostly relied on the banking sector indicators to be the representative of whole financial system in an economy. Finally, to the best of our knowledge, South Asian region has not been studied to spur light on this important economic phenomenon. To fill this gap, we have used eight different financial development indicators to study the relationship between remittances inflows and financial development in South Asia.

### **3 DATA AND METHODOLOGY**

The sample consists of five South Asian countries i.e. Pakistan, India, Sri Lanka, Bangladesh and Nepal. The annual panel data on financial development indicators to construct financial development index, workers' remittance inflows to GDP in terms of percentage, GDP (constant US\$) in terms of log, GDP per capita (constant US\$) in terms of log, Exports of goods and services (% of GDP), Inflation, GDP deflator (annual %), Foreign direct investment, net inflows (% of GDP) and Net official development assistance received (% GDP) is used for the period starting from 1989 to 2011. This time period has been chosen for the study because the data on financial development indicators for some countries for preceding years is not available. But this data is good enough to study the association between the workers' remittance inflows and financial sector development in South Asia.

Since, this study has used eight indicators of financial sector development; therefore, principal component analysis (PCA) is applied to construct one single variable of financial development that has captured the maximum variations for all the indicators used. PCA is an arithmetical algorithm that decreases the dimensionality of the statistical data at the same time as keeping the majority of the differences in the data set (Jolliffe, 2002). This decrease in dimensionality of data is done by recognizing directions, called principal components, along which the deviation in the data is maximum. By applying a small quantity of components, all samples can be symbolized by relatively a small numbers as opposed to the values for thousands of variables. Samples can then be plotted, that creates a possibility to visually evaluate similarities and dissimilarities between samples and decide whether

samples can be grouped. Different banking, equity and insurance sector indicators used to construct the financial development index are presented in Table 1.

**Table 1** Indicators and their Symbols used to Construct the Financial Development Index

S. No.	Indicators Used	Indicator's Symbol
1.	Liquid liabilities to GDP (%)	LL
2.	Deposit money bank assets to GDP (%)	DMBA
3.	Private credit by deposit money banks and other financial institutions to GDP (%)	PCDMBA
4.	Life insurance premium volume to GDP (%)	LIP
5.	Non-life insurance premium volume to GDP (%)	NLIP
6.	Stock market capitalization to GDP (%)	SMC
7.	Stock market total value traded ratio to GDP (%)	SMV
8.	Stock market turnover ratio to GDP (%)	SMT

To explore the relationship between remittances and financial development, we estimate pooled ordinary least squares (OLS) model. Following equations is used for this purpose:

$$FD_{i,t} = \alpha_{0i} + \beta_1 RI_{i,t} + \beta_2 X_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t} \quad (1)$$

Where,  $FD_{i,t}$  is the dependent Variable i.e. financial development index,  $RI_{i,t}$  presents the independent Variable i.e. remittance Inflows to GDP in terms of percentage,  $X_{i,t}$  is the matrix of Control variables,  $i$  and  $t$  indicate country and time, respectively.  $\mu_t$  is a time specific effect,  $\eta_i$  is an unobserved country-specific fixed effect and  $\varepsilon_{i,t}$  is the error term.

The independent variable i.e. remittance inflows has been taken as a ratio of workers' remittances to GDP in terms of percentage. The matrix  $X$  in Eq. (1) consists of number of control variables. These variables have been controlled because literature has suggested that they have an impact on financial development. These variables are log of GDP per capita (constant US\$), Exports of goods and services (% of GDP), Inflation, GDP deflator (annual %), Foreign direct investment (FDI) and net inflows (% of GDP). In all the estimations, other independent variables including GDP per capita in terms of log is used to gauge the level of economic development in the country are not the main variables and are taken as control variables. These variables have been controlled because of the reason that the development of financial sector needs to pay the fixed costs but these costs become less important as the country becomes richer and increases in

size. Moreover, log of GDP per capita can also be used as a proxy for the measurement of presence of quality legal institutions in an economy, which the literature have revealed to exert a positive effect on financial sector development. Inflation measured as GDP deflator (annual %) has been controlled because empirical studies have already proved that it distorts the decision making of the economic agents' regarding different aspects including nominal magnitudes, discouraging financial intermediation and encouraging savings in the real assets which affect financial development negatively. Studies have also proved that financial sector development is effected positively by capital and current account openness. Therefore, a number of variables of capital and current account openness have also been included in all the models to control for the degree of capital and current account openness. First, the share of exports to GDP has been controlled. Second, the flow of foreign direct investment in terms of percentage to GDP has been taken as control variables for capital inflows which exert positive effect on financial development. Table 2 presents the list of the independent and control variables used along with their symbols and expected signs with dependent variable i.e. financial development index.

**Table 2** Independent and Control Variables with their Symbols and Expected Signs

S. No.	Variables Used	Variable Symbol	Variable Type	Expected Sign with dependent variable (FD)
1.	Workers' remittances (% of GDP)	RI	Independent	Positive (+)
2.	Log of GDP per capita (constant US\$)	LGDPPC	Control	Positive (+)
3.	Foreign direct investment (FDI), net inflows (% of GDP)	FDI	Control	Positive (+)
4.	Exports of goods and services (% of GDP)	EXPT	Control	Positive (+)
5.	Inflation, GDP deflator (Annual %)	INF	Control	Negative (-)

Our equation estimated through OLS regression does not address issues regarding endogeneity. Theoretically, however, it is plausible, and also very likely, that both the magnitude of workers' remittances and the efficiency of financial institutions increase with higher growth rates. This would lead to an overstatement of the effect of each of the two variables and their interaction on growth. The

generalized method of moments (GMM) is a generic method used for estimating parameters in statistical models. It is most of the times used in the context of semi-parametric estimations, where the variable of interest is finite-dimensional while the full shape of the distribution function may not be known of the data and hence the maximum likelihood model may not be used. A certain number of moment conditions in the method are needed to be specified for the model. These moment conditions are the functions of the variables and the data having their expectation zero at the true values of the variables. The certain norm of the sample averages of the moment conditions are then minimized by the generalized method of moments (GMM). The estimators estimated through GMM are known to be consistent, efficient and asymptotically normal in the class of all estimators as they do not use any extra information other than the information contained in the moment conditions. In order to deal with the problem of potential bias due to reverse causality (discussed in introduction), estimations are carried out by using two period lags of all the regressors as instruments in a GMM dynamic framework following Arellano and Bover (1995). The instruments are needed to be used to cater the likely problem of endogeneity of the independent variables (especially, remittance inflows).

The coefficient of determination denoted by and adjusted R squared, points to how well data points justifies a line or curve, or just how sound free variable clarifies the difference in dependent variable. It is a sign used in the circumstance of statistical models whose major reason is either the calculation of potential results or the checking of hypotheses, on the origin of other associated information. It gives a gauge of how well pragmatic outcomes are simulated by the model, as the percentage of total difference of results elucidated by the model. In this study, R square has been applied to evaluate the explanation power of different regression models used. In a GMM model, the over-identifying restrictions can be tested by using a chi-square test. This is calculated when moment conditions are more than the parameters used in the estimation technique. The J-statistic also known as Sargan statistic is applied to check the validity of the instruments used in the GMM equation. The p-value of j-statistics/ Sargan statistic should be greater than 0.05 or 5% which means that the null hypothesis (the over-identifying restrictions are valid) cannot be rejected showing that the instruments used in the estimations are valid. On the other hand, if the p-value of j-statistic is less than 0.05 or 5% then the

null hypothesis (the over-identifying restrictions are valid) is rejected showing that the instruments used in the estimations are not valid.

#### **4 EMPIRICAL RESULTS**

For the given set of variables, principal component analysis is used to model the structure of the variance. The variation matrix's Eigen values are calculated to obtain the principal components. The maximum variations in the variables are captured by the first principal component. This is why it is said to be the unit linear combination of the variables. The rest of the components are orthogonal to the preceding components because they capture the rest of the variations between the unit length combinations and maximize it. The different aspects of the data are captured by the each principal component after the first one and is a linear combination of all the variables used (Huang, 2005).

In this study, principal component analysis is applied on all the financial indicators i.e. banking indicators, stock market indicators and insurance companies' indicators to make one variable of financial development. It has been attempted to include indicators those atleast have 70% observations in the data. In order to construct a significant index, efforts have also been made to include the maximum number of relevant indicators. It can be said that the constructed index contains the maximum information and variations from the variables used as it has been constructed based on the method of principal component analysis. The accumulated values and the proportion of variations explicated by the principal components are presented in the table 3. It can be noticed from the table that the maximum variations for all the indicators of different countries used are explained by the first component. The first principal component captures the 54.28% variation in the indicators while the first three components as per cumulative proportion explain the 87.4% variation. The rest of the components i.e. 4th to 8th explain the variations about 13% only. The second column, i.e. value column in table 3 presents the values of the principal components. The value for the first component is 4.34 and for the last component is 0.048. This column tells that the first component contains the highest value which keeps on decreasing till the last component ending up with the lowest value showing that the first component captures most of the variation in the data. The third column, i.e. difference column

represents the difference between the components which is also high for the first component and keeps on decreasing till the end.

**Table 3** Principal Components Analysis (1989-2011) No. of observations included: 86

<b>Eigen values: (Sum = 8, Average = 1)</b>								
Number	Value	Difference	Proportion	Cumulative				
				Value	Proportion	PC 1	PC 2	PC 3
1	4.342	2.712	0.5428	4.342	0.5428			
2	1.630	0.612	0.2038	5.973	0.7466			
3	1.017	0.423	0.1272	6.990	0.8739			
4	0.593	0.437	0.0742	7.584	0.9481			
5	0.156	0.038	0.0195	7.740	0.9676			
6	0.117	0.023	0.0147	7.858	0.9823			
7	0.094	0.046	0.0118	7.952	0.9940			
8	0.047	---	0.0060	8.000	1.0000			
<b>Eigenvectors (loadings):</b>								
Variable	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8
LL	0.432	-0.138	-0.189	0.258	-0.039	-0.766	0.316	-0.025
DMBA	0.436	-0.101	-0.294	0.199	0.140	0.278	-0.343	-0.676
PCDMB	0.408	-0.283	-0.184	0.319	-0.268	0.422	-0.015	0.605
LIP	0.426	-0.012	0.122	-0.433	0.686	-0.062	-0.200	0.314
NLIP	0.048	-0.338	0.829	0.409	0.100	-0.010	-0.073	-0.104
SMC	0.414	0.054	0.275	-0.440	-0.278	0.272	0.589	-0.236
SMV	0.304	0.532	0.250	-0.067	-0.475	-0.205	-0.531	0.075
SMT	0.080	0.698	0.037	0.486	0.349	0.188	0.326	0.058

**Note:** LL, DMBA, PCDMB, LIP, NLIP, SMC, SMV and SMT represent Liquid liabilities, Deposit money bank assets, Private credit by deposit money banks and other financial institutions, Life insurance premium volume, Non-life insurance premium volume, Stock market capitalization, Stock market total value traded ratio and Stock market turnover ratio to GDP (%), respectively.

All the positive values of the coefficients for the PC1 in the table show the overall measure for the financial development index. All the stock market indicators in the PC2 also show positive values. In PC3 the maximum weight of non-life Insurance premium to GDP represents that this indicator has strong influence in this component. Stock market turnover ratio which measures the efficiency of the stock markets is having the maximum positive weight in PC4. The higher positive weights of all the indicators i.e. banking, stock market and insurance companies for PC1 indicate that all the sectors contribute to the financial sector development in these countries (Saci, 2008). The correlation matrix between the financial development indicators and first principal components is shown in table 4. The correlation matrix shows that there is a strong positive correlation between almost all the indicators of financial development and the first principal component (PC1).

**Table 4** Correlation between Financial Development Indicators and Financial Development Index (1989-2011)

Variables	LL	DMBA	PCDMB	LIP	NLIP	SMC	SMV	SMT	Financials Development Index
LL	1								
DMBA	0.895	1							
PCDMB	0.879	0.902	1						
LIP	0.710	0.732	0.635	1					
NLIP	0.068	-0.046	0.156	0.105	1				
SMC	0.641	0.633	0.592	0.868	0.174	1			
SMV	0.400	0.405	0.248	0.564	-0.040	0.668	1		
SMT	0.052	0.085	-0.099	0.045	-0.217	0.099	0.657	1	
PC1 (FD)	0.902	0.909	0.851	0.889	0.100	0.864	0.636	0.168	1

**Note:** LL, DMBA, PCDMB, LIP, NLIP, SMC, SMV, SMT, PC1, PC2 and PC3 represent Liquid liabilities, Deposit money bank assets, Private credit by deposit money banks and other financial institutions, Life insurance premium volume, Non-life insurance premium volume, Stock market capitalization, Stock market total value traded ratio, Stock market turnover ratio, principal component 1, principal component 2 and principal component 3 respectively.

The descriptive statistics of the common sample of South Asian countries (Pakistan, India, Bangladesh, Sri Lanka and Nepal) are presented in Table 5. The dependent variable i.e. financial development (FD) calculated through principal component analysis (PCA) has 86 observations in this panel data. Financial development has a mean value of 0.063 with standard deviation 2.069 which shows that the maximum values of the data are between -2.069 and 2.069. The minimum value of FD is -3.247 while maximum is 6.464. As the variable indicates overall financial development in the region, it can be inferred that South Asian financial sector has become reasonably stable over time. The independent variable i.e. remittance inflows with the same number of observations has a mean value of 6.035 and standard deviation 4.988. The maximum variations in the data of this variable are between 1.047 and 11.023 while the minimum value of this variable is 0.980 and maximum is 23.22. Remittances inflows as percentage of GDP are the second largest source of international flows after exports. FDI inflows are the third important source of international flows to the host economies in South Asia. GDP per capita has been transformed into natural log for to avoid the outlier's effect, hence, it can be interpret as the elasticity. The correlation between the remittance inflows and financial development index (FD) is positive and is according to the theory i.e. remittance inflows have positive impact on financial sector development. The value of correlation between remittances and FD is 0.17. The

correlation matrix is also used to detect the multicollinearity between the independent variables used in this study. Multicollinearity can be a significant problem if the correlation between the independent variables is more than 0.80 but the correlation coefficients of all the variables are below 0.80.

*Table 5* Descriptive Statistics and Correlation Matrix (1989-2011).

Variables	FD	RI	LGDPCC	EXPT	INF	FDI
Mean	0.063	6.035	2.751	18.881	7.952	0.943
Median	-0.697	4.185	2.762	16.283	7.278	0.817
Maximum	6.463	23.220	3.207	39.016	24.891	3.668
Minimum	-3.247	0.980	2.422	8.852	1.585	-0.098
Std. Dev.	2.069	4.988	0.213	7.966	4.426	0.818
IQR	1.918	4.690	0.349	5.496	10.403	0.856
Observations	86	86	86	86	86	86
FD	1					
RI	0.17**	1				
LGDPCC	0.31*	-0.09	1			
EXPT	-0.06	-0.02	0.55*	1		
INF	0.00	0.12	0.32*	0.08	1	
FDI	0.48*	-0.18*	0.64*	0.26**	0.26**	1

**Note:** \* & \*\* indicate the significance level at 1% and 5%, respectively. Std. Dev. and IQR represent standard deviation and interquartile range respectively.

Results of financial development equation (1) with OLS estimation are reported in Table 6. The t-statistics on remittances coefficient (3.841) indicates that there is a statistically significant positive relationship between workers' remittances and financial development in South Asia. The coefficient for the workers' remittances stood at 0.126, which means one percent increase in worker's remittances (% GDP) will increase financial development in South Asia by 0.126 percent. It is important to note that financial development here presents the development in all eight indicators of banking, equity and insurance sectors.

Finally, GMM technique is used and to address the problem of endogeneity caused by reverse causation, GMM dynamic system estimation is carried out following Arellano and Bover (1995). These estimations are done by taking two period lags of all the regressors as instruments in the model. The results (Table 7) indicate that there is a statistically significant and positive relationship between workers' remittances and financial development. Levels of income and FDI flows are also significant have a positive impact on financial development in both models. This is because Log of GDP

per capita has been used as a proxy for the quality of legal institutions in the country which has a positive relation with the financial development. Thus the countries in South Asia have better legal institutions which impact financial development positively. FDI inflows to GDP percentage also contribute toward the financial development in the region. These results are consistent with the findings of Aggarwal et al. (2011). Inflation and exports have a slight negative impact on the financial development. The relationship between remittances and financial development as indicated by coefficient (0.155) in column (2) is the phenomenon under study here and thus is critical. The other columns represent the results of Eq. 2 to 8 which have been estimated to examine the robustness of results to the simple changes in basic specification. These results indicate the sensitivities of the coefficients to the changes in specification. It is observed that changes do not alter the coefficient results to the extent of sign and significance and hence are minimal. The estimated impact of remittances inflows on financial development is robust under different equation specifications. The goodness of fit as observed through R-squares and adjusted R-squares also has reasonable values. An autoregressive (AR) process is also introduced while estimating the equation to remove any autocorrelation problem from the models. The values of Durbin-Watson (DW) statistics are closer to the desired value of two which indicates absence of autocorrelation problem.

**Table 6** Pooled OLS Estimates of the Relationship between Financial Development and Remittance (1989 – 2011)

Equation	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Variables</b>								
Intercept	-7.510 (-2.869)*	-10.581 (-4.738)*	-1.828 (-5.936)*	-0.533 (-1.051)	-0.267 (-0.570)	-2.813 (-1.082)	-7.208 (-2.678)*	-14.928 (-6.228)*
Remittances	0.126 (3.841)*	0.095 (2.445)**	0.115 (3.272)*	0.109 (2.586)**	0.111 (2.635)*	0.114 (3.182)*	0.122 (3.635)*	0.105 (2.861)*
Growth (per capita)	1.316 (2.775)*	1.605 (4.509)*				0.168 (0.381)	1.138 (2.355)*	2.577 (2.861)*
FDI	1.345 (5.140)*		1.450 (6.915)*			1.376 (4.821)*	1.318 (4.897)*	2.577 (6.109)*
Exports	-0.094 (-4.118)*			-0.003 (-0.136)			-0.092 (-3.913)*	
Inflation	-0.096 (-2.748)*				-0.039 (-0.889)			-0.098 (-3.815)*
AR(1)	0.264 (3.735)*	0.487 (6.591)*	0.779 (2.662)*	0.866 (2.184)*	0.893 (2.291)*	0.645 (3.122)*	0.373 (2.678)*	0.469 (2.242)*
R <sup>2</sup>	0.457	0.201	0.338	0.156	0.162	0.339	0.420	0.293
Adjusted R <sup>2</sup>	0.433	0.187	0.326	0.139	0.146	0.321	0.399	0.274
Std. Er. of reg.	0.596	0.912	0.872	1.618	1.945	0.834	1.083	0.996

Equation	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DW statistics	1.871	2.052	2.206	1.493	1.806	2.322	2.109	2.075

**Note:** Values in parentheses denote underlying student-t values. The t statistics significant at 5 % and 10 % levels of significance are indicated by \* and \*\* respectively.

**Table 7** GMM Estimates of the Relationship between Financial Development and Remittance (1989 – 2011)

Equation	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables								
Intercept	-5.239 (-1.300)*	-9.921 (-4.269)*	-1.919 (-)	-0.360 (-0.664)	0.810 (0.850)	-0.093 (-0.027)	-5.114 (-1.481)	0.085 (0.022)
Remittances	0.155 (3.585)*	0.094 (2.297)**	0.115 (3.080)*	0.112 (2.541)**	0.128 (2.720)*	0.119 (3.106)*	0.124 (3.442)*	0.149 (3.304)*
Growth (per capita)	1.185 (1.870)***	1.508 (4.088)*				0.317 (0.539)	0.785 (1.243)	0.001 (0.001)
FDI	1.943 (3.730)*		1.587 (5.841)*			1.758 (3.799)*	1.590 (3.634)*	2.106 (3.900)*
Exports	-0.102 (-3.432)*			-0.010 (-0.389)			-0.096 (-)	
Inflation	-0.330 (-2.847)				-0.172 (-1.507)			-0.315 (-)
AR(1)	0.251 (2.734)*	0.687 (4.374)*	0.763 (2.831)*	0.866 (2.372)*	0.943 (3.171)*	0.765 (2.012)*	0.227 (1.887)*	0.783 (2.012)*
R <sup>2</sup>	0.292	0.186	0.218	0.150	0.172	0.311	0.400	0.193
Adjusted R <sup>2</sup>	0.253	0.170	0.2061	0.133	0.166	0.291	0.377	0.174
Std. Er. of reg.	0.934	0.879	1.272	1.526	1.828	0.635	1.116	1.023
DW statistics	2.232	2.131	1.998	2.954	1.752	1.818	2.118	2.546

**Note:** Values in parentheses denote underlying student-t values. The t statistics significant at 5 % and 10 % levels of significance are indicated by \* and \*\* respectively.

## 5 CONCLUSIONS

This study examines the impact of remittance inflows on financial development by using eight major indicators of banking, equity and insurance sectors in South Asia. Data of five South Asian countries from 1989 to 2011 is used for the empirical analysis. Result of pooled OLS and GMM estimations confirm that remittances inflows have a positive and significant impact on financial sector development. GMM methodology is used to cater for the endogeneity biases resulting from reverse causality. Factors that drive financial development have a differential impact in South Asia. Specifically, economic growth and FDI enhance financial development. Inflation and exports are to deteriorate financial development in the region. These results are robust under different model

specifications. The study would be of great significance if the governments of these South Asian economies identified the potential development implication of remittance inflows and also take several steps that are needed to be undertaken to formally channelize these inflows into the economy. Various savings, investment opportunities and tax initiatives e.g. non-resident foreign currency deposits, different types of investment bonds, full tax exemption etc for the income of remittance inflows can be undertaken. Well-developed institutions which are crucial to minimize the informal transfer of remittance inflows and illegal trafficking of migrants can be setup. Attractive investment opportunities can be provided by the insurance companies to attract these inflows into the financial sector. Finally, Accessibility to the financial products and services can be made convenient that ultimately can motivate migrants to transfer their valuable remittance earnings into the financial sector, which ultimately will lead to the economic growth in the economy.

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# DOES A DIFFERENT YEAR OF STUDY MEANS DIFFERENT IMPORTANT CREDIBILITY DIMENSIONS? A STUDY ON THE DIMENSIONS OF CREDIBILITY OF ONLINE SALES WEBSITES

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**Abstract:** *Web sites credibility is an important e-marketing issue that influences consumer behavior and buying intention. Two sub-samples were investigated in this study. The purpose of study is to identify differences in perception of the two sub-samples on dimensions of credibility of online sales Website. The aims are: (1) to identify dimensions significantly differently evaluated by the two categories of respondents; (2) to identify important dimensions from the perspective of one of the groups; (3) to identify important dimensions from the other group's perspective. While students in second year of study (the first sub-sample) consider five dimensions to be important (detailed information, relationship – communication, expertise, framing adverts and personal experience), third year of study students (the second sub-sample) put a special emphasis on two dimensions (real world feel and expertise). We notice that both categories of students consider the dimension of expertise to be important. Different year of study means different professional experience due to certain courses.*

**Keywords:** *credibility, Website, regression analysis, dimension, construct*

**JEL classification:** *M31, M39*

## 1 INTRODUCTION

The “credible information” was defined by Fogg and Tseng (1999) as the information that is believed to be secure and trustworthy. Although this is the first explanation of this concept, this approach has appeared earlier in the psychological literature in persuasion phenomena studies (Ceobanu and Anton, 2008). Once

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psychological concept migrated to the field of marketing, credibility has been one of the concepts that marketing researchers started to study as well.

Assessment of credibility is essentially important as credible sources of information (including commercial messages) are more likely to change the behavior of consumers in the intended manner. A credible source of information is studied more in detail and convinces the target to actually buy the promoted product. A better credibility leads to behavioral loyalty that manifests when customers have nice words to say about the company or the Website, express their preference for the company or the Website or are able to pay more for the same products (Bobâlcă, 2014).

Due to its important role, credibility has been studied for various sources of information: newspapers, television, radio, magazines, Internet (Flanagin and Metzger, 2000; Savolainen, 2007). The Internet credibility has been studied for different types of Web pages - blogs, forums, socializing Websites, e-mail messages, professional Websites, etc. (Wasserman and Todd, 2006; Chun Ho, 2006; Garrison, 2003, Metzger and Hall, 2005) – and different types of information presentation (Jain and Posavac, 2001; Trifts and Häubl, 2003; Amado and Guittet, 2007; Clark and Slotta, 2000).

In the Internet credibility literature, Fogg et. al (2001) research has been extensively cited. Research looked into the construct of credibility of Websites and concluded that of credibility are: *Real-World Feel, Ease of Use, Expertise, Trustworthiness, Tailoring, Commercial Implications, and Amateurism*. Other researchers investigated the construct of website credibility in specific contexts: health Websites, finance Websites, presentation manner of information and sources attributed to Websites, etc. (Hong, 2006; Stanford, 2002; Morrison, 2005). Each study identified a different combination of dimensions of credibility.

Most common credibility dimensions of websites identified in the literature are (Manolică et. al, 2011): *expertise* (Hong, 2006; Fogg, 2001), *goodwill* (Hong, 2006), *trustworthiness* (Hong, 2006; Fogg, 2001; Morrison, 2005), *depth/sufficiency* (Hong, 2006; Morrison, 2005), *fairness /privacy/bias* (Hong, 2006; Morrison, 2005), *real-world feel/identity* (Fogg, 2001), *ease of use* (Fogg, 2001), *commercial implications/ advertising and sponsorships* (Fogg, 2001), *sufficiency* (Morrison, 2005), *decision* (Morrison, 2005), *confidence* (Morrison, 2005), *accuracy* (Morrison, 2005).

Various aspects, such as Electronic Word of Mouth (eWOM) were favoured by trust (Chiosa, 2014a); trust is related to credibility. Andrei and Zaiț (2014) study provides insights into brand nurturing process on social networking web sites, especially useful for friendly, social oriented brands.

Two sub-samples were investigated in this study. The purpose was to identify differences in perception of the two sub-samples on dimensions of credibility of an online sales Website. The objectives are: (1) to identify dimensions significantly differently evaluated by the two categories of respondents; (2) to identify important dimensions from the perspective of one of the groups; (3) to identify important dimensions from the other group's perspective. While students in second year of study (the first sub-sample) consider five dimensions to be important (*detailed information, relationship – communication, expertise, framing adverts and personal experience*), third year of study students (the second sub-sample) put a special emphasis on two dimensions (*real world feel and expertise*). We notice that both categories of students consider the dimension of expertise to be important.

## 2 RESEARCH METHOD

The *purpose* of this study was to identify differences in perception of two sub-samples regarding the dimensions of credibility of an online sales Website.

The *hypothesis* is that small differences in the level of education result from different perceptions of dimensions of credibility of websites.

There were 217 respondents initially included in the study. The *sample* was formed of students from the Faculty of Economics and Business Administration of the “Alexandru Ioan Cuza” University in Iași, Romania. Respondents were separated in two sub-samples during the study: second year of study students (88 respondents) and third year of study students (129 students). The only difference between the two sub-samples is represented by one extra year of professional experience in case of the third year of study respondents. All respondents were randomly selected from various specialization of the Faculty.

Quantitative survey was the *method* selected for this research. In order to complete the questionnaire, each respondent was placed in front of a computer connected to the Internet. Each student analysed the opened Webpage (the same Webpage for all the respondents) and completed the items in the questionnaire

according to their perception of the analysed Webpage. The site was an online clothing sales page.

The instrument contained 14 items. Each of the first 13 items represented a dimension of the online sales commercial Websites credibility construct determined in a previous research (Ciobanu, 2011): (-) *detailed information*; (-) *ease of use*; (-) *support system*; (-) *booking and delivery*; (-) *real world feel*; (-) *reference-authority*; (-) *trustworthiness*; (-) *aggressive advertising*; (-) *relationship – communication*; (-) *expertise*; (-) *framing adverts*; (-) *personal experience*; (-) *type of seller*. The end of the questionnaire continued with one more items that assessed the general overall credibility of the Website.

For each of the 14 items, a 7 points scale was used:

1 – criterion is not accomplished;                      7 – criterion is very accomplished

1	2	3	4	5	6	7

The questionnaire contained the items, as follows (reproduced from Ciobanu, 2011):

1. The web site offers detailed information about the company and its products – corresponding to *detailed information* dimension;
2. The web site is easy to use – corresponding to *ease of use* dimension;
3. The products promoted by the site are well supported – corresponding to *support system* dimension;
4. Ordering seems easy to be initiated and done, although the site does not insist on ordering – corresponding to *booking and delivery* dimension;
5. The contact information available on the site makes me believe the company is real – corresponding to *real world feel* dimension;
6. The articles included on the site have references and contact information of their authors – corresponding to *reference-authority* dimension;
7. I trust this site – corresponding to *trustworthiness* dimension;
8. The products are aggressively promoted by the site, without being clearly delivered all details about the product – corresponding to *aggressive advertising* dimension;
9. The site has an active, opened relating-communicating policy – corresponding to *relationship – communication* dimension;
10. The company is an expert in its field – corresponding to *expertise* dimension;

11. Adverts are well framed - corresponding to *framing adverts* dimension;
12. The products are promoted by the site according to reality – corresponding to *personal experience* dimension;
13. The seller is a company – corresponding to *type of seller* dimension;
14. How credible is the overall site? – corresponding to overall credibility assessment.

### **3 RESULTS**

#### **Objective 1 - identifying dimensions significantly differently evaluated by the two categories of respondents**

The two categories of respondents are second year of study students and third year of study students. Significant differences between the two categories analysed, from the evaluation of each variable point of view, were identified using Independent samples T test (see Table 1).

**Table 1** Independent Samples T Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
The site offers detailed information about the company and its' products	Equal variances assumed	,617	,433	2,346	215	,020	,484	,206	,077	,891
	Equal variances not assumed			2,377	195,282	,018	,484	,204	,082	,886
The site is easy to use	Equal variances assumed	,000	,990	,927	215	,355	,137	,148	-,155	,429
	Equal variances not assumed			,916	179,655	,361	,137	,150	-,158	,433
The products promoted by the site are well supported	Equal variances assumed	,547	,460	,870	215	,385	,186	,213	-,235	,606
	Equal variances not assumed			,863	181,641	,389	,186	,215	-,239	,610
Ordering seems easy to be initiated and done, although the site does not insist on ordering	Equal variances assumed	3,288	,071	1,629	214	,105	,286	,176	-,060	,632
	Equal variances not assumed			1,679	202,235	,095	,286	,170	-,050	,622
The contact information available on the site makes me believe the company is real	Equal variances assumed	2,189	,140	1,623	215	,106	,242	,149	-,052	,536
	Equal variances not assumed			1,682	207,080	,094	,242	,144	-,042	,526
The articles included on the site have references and contact information of their authors	Equal variances assumed	,165	,685	2,134	214	,034	,547	,256	,042	1,052
	Equal variances not assumed			2,138	185,832	,034	,547	,256	,042	1,052

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
I trust this site	Equal variances assumed	,098	,754	,873	215	,384	,183	,210	-,230	,597
	Equal variances not assumed			,866	181,786	,388	,183	,211	-,234	,600
The products are aggressively promoted by the site, without being clearly delivered all details about the product	Equal variances assumed	1,359	,245	,984	215	,326	,236	,240	-,237	,708
	Equal variances not assumed			,965	174,343	,336	,236	,244	-,246	,718
The site has an active, opened relating-communicating policy	Equal variances assumed	3,989	,047	1,288	215	,199	,230	,178	-,122	,581
	Equal variances not assumed			1,346	210,267	,180	,230	,171	-,107	,566
The company is an expert in its field	Equal variances assumed	2,162	,143	2,755	214	,006	,441	,160	,126	,757
	Equal variances not assumed			2,867	206,506	,005	,441	,154	,138	,745
Adverts are well framed	Equal variances assumed	,034	,854	1,253	215	,212	,228	,182	-,131	,587
	Equal variances not assumed			1,248	184,361	,214	,228	,183	-,133	,589
The products are promoted by the site according to reality	Equal variances assumed	3,545	,061	-,985	215	,326	-,246	,250	-,739	,246
	Equal variances not assumed			-1,017	205,394	,310	-,246	,242	-,724	,231
The seller is a company	Equal variances assumed	,163	,687	2,331	215	,021	,674	,289	,104	1,244
	Equal variances not assumed			2,335	188,286	,021	,674	,289	,105	1,243

Four variables have been evaluated significantly differently by students. These variables are: *detailed information, reference-authority, expertise, type of seller*. This is only partially supporting the research hypothesis of different evaluation of the online environment of the two sub-samples.

**Objective 2 – identifying the important credibility’s dimensions of online sales clothes Websites, from students’ perception in the second year of study**

Regression analysis, enter method output reveals the important independent variables from all the independent variables. For this reason, regression analysis was conducted, as the sample size allowed running this analysis (88 students in the second year of study for 13 independent variables exceeds the minimum of 5 respondents per each variable - Garson, 2010). The independent variables were represented by of credibility of online sales Websites. The dependent variable was represented by the evaluation of the overall credibility of the analyzed site.

45 % of the variability of dependent variable is explained.

*Table 2* R and R Square values

Model	R	R Square	Adjusted Square	R Std. Error of the Estimate
1	,736(a)	,542	,458	,957

a Predictors: (Constant), The seller is a company, The contact information available on the site makes me believe the company is real , The products are promoted by the site according to reality, The company is an expert in its field, The site has an active, opened relating-communicating policy, The articles included on the site have references and contact information of their authors, The products promoted by the site are well supported , I trust this site, The products are aggressively promoted by the site, without being clearly delivered all details about the product, The site is easy to use, Adverts are well framed, The site offers detailed information about the company and its' products, Ordering seems easy to be initiated and done, although the site does not insist on ordering

b year\_of\_study = 2,00

The Anova test results reject the hypothesis that coefficients in the regression model equal 0. In conclusion, the independent variables altogether explain the variation of the dependent variable.

**Table 3** Anova test

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	76,731	13	5,902	6,451	,000(a)
	Residual	64,963	71	,915		
	Total	141,694	84			

a Predictors: (Constant), The seller is a company, The contact information available on the site makes me believe the company is real , The products are promoted by the site according to reality, The company is an expert in its field, The site has an active, opened relating-communicating policy, The articles included on the site have references and contact information of their authors, The products promoted by the site are well supported , I trust this site, The products are aggressively promoted by the site, without being clearly delivered all details about the product, The site is easy to use, Adverts are well framed, The site offers detailed information about the company and its' products, Ordering seems easy to be initiated and done, although the site does not insist on ordering

b Dependent Variable: How credible is the overall site?

c year\_of\_study = 2,00

Five independent variables have a significant relationship with the dependent variable, according to the Function Coefficients table: *detailed information* (“The site offers detailed information about the company and its' products”), *relationship – communication* (“The site has an active, opened relating-communicating policy”), *expertise* (“The company is an expert in its field”), *framing adverts* (“Adverts are well framed”) and *personal experience* (“The products are promoted by the site according to reality”). These are the five important dimensions of the credibility construct of clothes online sales Websites.

**Table 4** Function Coefficients

Model	Non-standardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1						
	(Constant)	2,227	1,233		1,807	,075
	The site offers detailed information about the company and its' products	,235	,093	,263	2,533	,014
	The site is easy to use	-,101	,117	-,087	-,863	,391

Model	Non-standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	2,227	1,233		1,807	,075
The products promoted by the site are well supported	-,090	,081	-,112	-1,123	,265
Ordering seems easy to be initiated and done, although the site does not insist on ordering	-,069	,126	-,062	-,549	,585
The contact information available on the site makes me believe the company is real	,083	,127	,061	,652	,517
The articles included on the site have references and contact information of their authors	,108	,069	,153	1,567	,122
I trust this site	,033	,084	,040	,391	,697
The products are aggressively promoted by the site, without being clearly delivered all details about the product	,014	,069	,020	,201	,841
The site has an active, opened relating-communicating policy	,282	,108	,244	2,602	,011
The company is an expert in its field	,497	,119	,391	4,174	,000
Adverts are well framed	-,437	,098	-,453	-4,436	,000
The products are promoted by the site according to reality	,291	,070	,370	4,153	,000
The seller is a company	,101	,057	,164	1,777	,080

a Dependent Variable: How credible is the overall site?

b year\_of\_study = 2,00

A new regression analysis was conducted on the same sub-sample (second year of study students), including only the five important dimensions as independent variables and the same overall credibility assessment as dependent variable.

*Table 5* R and R Square values

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate
1	,690(a)	,476	,444		,958

a Predictors: (Constant), The products are promoted by the site according to reality, The company is an expert in its field, The site has an active, opened

relating-communicating policy, Adverts are well framed, The site offers detailed information about the company and its' products.

*Table 6* Function Coefficients

1 Model	Non-standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2,218	,801		2,768	,007
The site offers detailed information about the company and its' products	,204	,083	,229	2,454	,016
The site has an active, opened relating-communicating policy	,308	,099	,267	3,106	,003
The company is an expert in its field	,501	,112	,394	4,460	,000
Adverts are well framed	-,399	,088	-,416	-4,536	,000
The products are promoted by the site according to reality	,309	,067	,392	4,607	,000

a Dependent Variable: How credible is the overall site?

The relationship between the five independent variables and the dependent variable is explained by the equation given below, available only for clothes online sales Websites, assessed by second year of study students:

$$\text{Credibility} = 2.218 + 0.204 * \text{detailed information} + 0.308 * \text{relationship - communication} + 0.501 * \text{expertise} - 0.399 * \text{framing adverts} + 0.309 * \text{personal experience}$$

### **Objective 3 identifying the important credibility's dimensions of online sales clothes Websites, from students' perception in the third year of study**

Regression analysis, enter method, was conducted again with the same independent variables (the 13 items corresponding to the 13 credibility dimensions of clothes online sales Websites) and the same dependent variable (the overall Website credibility assessment) for third year of study students. The sample size (129 students) exceeds the minimum of 5 respondents per each independent variable.

42% of the variability of dependent variable is explained.

*Table 7* R and R Square values

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate
1	,695(a)	,482	,424		,769

a Predictors: (Constant), The seller is a company, The articles included on the site have references and contact information of their authors, The products are aggressively promoted by the site, without being clearly delivered all details about the product, The company is an expert in its field, Ordering seems easy to be initiated and done, although the site does not insist on ordering, The products are promoted by the site according to reality, The site offers detailed information about the company and its' products, The site has an active, opened relating-communicating policy, I trust this site, Adverts are well framed, The products promoted by the site are well supported , The contact information available on the site makes me believe the company is real , The site is easy to use

b year\_of\_study = 3,00

The Anova test value rejects the hypothesis that coefficients equal 0. Independent variables altogether explain the variation of the dependent variable.

*Table 8* Anova test

Model		Sum Squares	Df	Mean Square	F	Sig.
1	Regression	63,462	13	4,882	8,245	,000(a)
	Residual	68,089	115	,592		
	Total	131,550	128			

a Predictors: (Constant), The seller is a company, The articles included on the site have references and contact information of their authors, The products are aggressively promoted by the site, without being clearly delivered all details about the product, The company is an expert in its field, Ordering seems easy to be initiated and done, although the site does not insist on ordering, The products are promoted by the site according to reality, The site offers detailed information about the company and its' products, The site has an active, opened relating-communicating policy, I trust this site, Adverts are well framed, The products promoted by the site are well supported , The contact information available on the site makes me believe the company is real , The site is easy to use

b Dependent Variable: How credible is the overall site?

c year\_of\_study = 3,00

There are two important dimensions of the construct for the sub-sample of third year of study students: *real world feel* (“The contact information available on the site makes me believe the company is real”) and *expertise* (“The company is an expert in its field”).

*Table 9* Function Coefficients

Model	Non-standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1,103	,620		1,778	,078
The site offers detailed information about the company and its' products	,021	,053	,032	,402	,688
The site is easy to use	,148	,091	,152	1,619	,108
The products promoted by the site are well supported	,008	,055	,012	,141	,888
Ordering seems easy to be initiated and done, although the site does not insist on ordering	-,039	,056	-,052	-,696	,488
The contact information available on the site makes me believe the company is real	,245	,079	,280	3,096	,002
The articles included on the site have references and contact information of their authors	,068	,045	,124	1,515	,133
I trust this site	,092	,057	,135	1,620	,108
The products are aggressively promoted by the site, without being clearly delivered all details about the product	-,026	,047	-,043	-,554	,581
The site has an active, opened relating-communicating policy	,054	,060	,074	,897	,372
The company is an expert in its field	,164	,068	,201	2,427	,017
Adverts are well framed	,043	,066	,055	,654	,515

Model	Non-standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
The products are promoted by the site according to reality	,013	,038	,024	,335	,738
The seller is a company	,057	,034	,118	1,655	,101

a Dependent Variable: How credible is the overall site?

b year\_of\_study = 3,00

In a new regression analysis that included only the two important dimensions as perceived by the third year of study students, the model explains 36% of the variability of dependent variable.

*Table 10* R and R Square values

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate
1	,610(a)	,373	,363		,809

a Predictors: (Constant), The company is an expert in its field, The contact information available on the site makes me believe the company is real

*Table 11* Function Coefficients

Model	Non-standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1					
(Constant)	1,884	,454		4,153	,000
The contact information available on the site makes me believe the company is real	,413	,063	,470	6,539	,000
The company is an expert in its field	,251	,059	,308	4,282	,000

a Dependent Variable: How credible is the overall site?

The relationship between the two important dimensions as perceived by third year of study students and the dependent variable is explained by the equation below:

$$\text{Credibility} = 1.884 + 0.414 * \text{real world feel} + 0.251 \text{ expertise}$$

#### 4 CONCLUSIONS

Past research approaches credibility perception based on different consumer characteristics. For example, in their study, Fogg et al. (2001) identified the credibility dimensions of general Web sites and compared results of demographic subgroups defined by age, gender, country of origin, education level, income level and experience with Web. Also, Stanford et al. (2002) analysed the credibility of health and finance Web sites in a comparative study that involved two groups: experts and online consumers.

In this study, while students in second year of study consider five dimensions to be important (*detailed information, relationship – communication, expertise, framing adverts and personal experience*), third year of study students put a special accent on two dimensions (*real world feel and expertise*).

We notice that both categories of students consider to be important the dimension of *expertise*. All the other dimensions taken in consideration are different for each of the two sub-samples analysed. The first category of students are focused on aspects considering first impression (*detailed information, framing adverts*) and relating (*relationship-communication, personal experience*). Older students are focused on practical details concerning security. They want to make sure the company exists in reality. This difference in assessing the credibility dimensions is given by the different experiences in the online world between the two sub-samples.

Except for the dimension “*personal experience*”, all the other dimensions are ranked lower by older students (third year of study students). This aspect proves that one extra year of experience brings more experience in the online world and more exigency in evaluating the credibility dimensions.

**Table 12** Means values of variables included in the analysis

	year_ of_ study	N	Mean	Std. Deviation	Std. Error Mean
The site offers detailed information about the company and its' products	2,00	88	5,52	1,430	,152
	3,00	129	5,04	1,533	,135
The site is easy to use	2,00	88	6,26	1,109	,118
	3,00	129	6,12	1,046	,092

	year_ of_ study	N	Mean	Std. Deviation	Std. Error Mean
The products promoted by the site are well supported	2,00	88	5,51	1,583	,169
	3,00	129	5,33	1,516	,134
Ordering seems easy to be initiated and done, although the site does not insist on ordering	2,00	87	5,74	1,146	,123
	3,00	129	5,45	1,340	,118
The contact information available on the site makes me believe the company is real	2,00	88	6,42	,956	,102
	3,00	129	6,18	1,155	,102
The articles included on the site have references and contact information of their authors	2,00	87	4,63	1,837	,197
	3,00	129	4,09	1,854	,163
I trust this site	2,00	88	4,80	1,555	,166
	3,00	129	4,61	1,491	,131
The products are aggressively promoted by the site, without being clearly delivered all details about the product	2,00	88	3,03	1,835	,196
	3,00	129	2,80	1,660	,146
The site has an active, opened relating-communicating policy	2,00	88	5,63	1,107	,118
	3,00	129	5,40	1,400	,123
The company is an expert in its field	2,00	87	5,71	1,011	,108
	3,00	129	5,27	1,242	,109
Adverts are well framed	2,00	88	5,69	1,334	,142
	3,00	129	5,47	1,305	,115
The products are promoted by the site according to reality	2,00	88	1,59	1,623	,173
	3,00	129	1,84	1,924	,169
The seller is a company	2,00	88	5,19	2,078	,222
	3,00	129	4,52	2,099	,185

Although the result of the first objective concludes that the two sub-samples do not evaluate significantly different the credibility dimensions, the hypothesis was confirmed. Only one extra year of professional and online experience leads to considering different dimensions as being important. One dimension is important for both categories though: *the expertise*.

This study brings a contribution as it reveals that one extra year of study leads to important differences in perceptions of dimensions online sales Websites as they have been presented before.

According to these findings, Web designers and E-Marketing managers can choose to adapt the content of their Web sites considering aspects such as the target's experience in terms of the Web. Findings are important as this adaptation of the Web site leads to increased perceived credibility.

### ***Research limitations***

The fact that the research included students from one faculty only is an important limitation. If the study involved respondents from various faculties and universities, the results could have been more reliable.

Another limitation is that these results are applicable for students only, as Internet shoppers of clothes. For any other type of target or type of online promoted products, a new research needs to be conducted.

Although the sample size is not a limit considering the entire method of the conducted regression analysis, a larger sample (at least 40 respondents per each variable in every regression analysis) could have made it possible to use a stepwise regression with more concluding results.

### ***Future research***

The two sub-samples analysed in this paper are different thru the experience perspective. One extra year is not a difference in itself but the experience that the extra year brings with it. Further research could investigate the same aspect on a different type of target with the same age difference to confirm whether one year difference brings the same different results for another type of target.

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## NBA ENDGAME: DO SALARIES MATTER?

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**Abstract:** *This paper estimates the association between salary dispersion and the probability that an NBA team leading two minutes before the end of a playoff game won the game. Economic theory indicates the a priori relationship is ambiguous and the existing empirical literature finds mixed results as to the direction of the relationship. We use game-level data from the 2012 and 2013 NBA playoffs and allow the association to be nonlinear. Overall, our results indicate there may be U-shaped relationship between salary dispersion and win probabilities; however, the point estimates individually and jointly are not statistically significant. Thus, we conclude there is no evidence in our sample that salary dispersion and NBA win probabilities are related.*

**Keywords:** *Salary dispersion; labor economics; National Basketball Association*

**JEL Classification:** *J3, D2*

### 1 INTRODUCTION

In 1995, a National Basketball Association (NBA) collective bargaining agreement (CBA) resulted in a change in the distribution of wages in the NBA. From the pre-1995 CBA to post-1995 CBA time period, mean NBA salaries grew 78.5% whereas median salaries only rose by 31.3% (Hill and Groothuis 2001), the average coefficient of variation of NBA salaries increased 17.2% (Berri and Jewell 2004), and the average Gini coefficient for all NBA teams increased from

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0.336 to 0.411 (Simmon and Berri 2011). Economic theory indicates an ambiguous effect of wage dispersion on team performance. According to the theory of tournaments (Lazear and Rosen 1981), greater salary inequality creates competition among workers resulting in more worker effort and increased productivity. Alternatively, cohesion theory (Levine 1991) suggests that equalizing salaries increases productivity as cohesiveness among workers is enhanced. Katayama and Nuch (2011) argue the latter may better explain behavior in the NBA as cooperation among players is necessary for passing, defense, and ultimately final game outcomes.

Previous empirical studies examining salary dispersion and team performance in the NBA find mixed results. Using season-level data from six seasons after the 1995 CBA and game-level data from the 2002 to 2006 regular seasons, Berri and Jewell (2004) and Katayama and Nuch (2011), respectively, find no evidence that salary dispersion and NBA team performance are related. Conversely, Simmons and Berri (2011) use data from the 1990 to 2008 seasons and find that both team and player performances are positively related to salary dispersion which supports tournament theory. In this study, we use game-level data during the 2012 and 2013 playoffs to examine the relationship between wage dispersion and team performance.

During the 2012 and 2013 seasons, the NBA salary cap was \$58.044 million; however, NBA franchises could choose how pay is structured among players. For example, in 2013, the Los Angeles Lakers concentrated its pay among its top four paid athletes (77%) whereas the Sacramento Kings distributed its pay more equally among its athletes (44% went to the top four paid athletes). This article contributes to the existing body of NBA literature on this topic in three ways. First, it uses recent game-level data during the playoffs rather than the regular season. Second, our measure of team performance is “late game winner” or the team leading *two minutes* before the end of a playoff game wins the game. The playoffs in general and the final two minutes of a game in particular are crucial in terms of team performance. Indeed, the NBA requires a public address operator to announce that the game is in the two-minute part (NBA, 2013). Thus, we are interested in how salary dispersion is related to team performance in terms of win probabilities. Third, we allow for the relationship between salary dispersion and team performance to be non-linear. Examining the German soccer league, Franck and

Nuesch (2011) find a U-shaped relationship between salary inequality and team success which supports both tournament and cohesion theories. That is, team performance is strongest when there is very low wage inequality (cohesion) or very high inequality (tournament) (Franck and Nuesch 2011). In the following section, we discuss the empirical literature relevant to this study.

## 2 RELATED LITERATURE

NBA playoff games are very competitive. Teams face elimination possibility and play each other several times; thus, becoming accustomed to each other's style of play. Because such competitive games generate a lot of interest and discussion among fans and sports presenters, there are two bodies of literature that are relevant for this study. First, a number of sports prediction studies have been conducted that use regular season team performance measures to forecast the outcome of professional sports game. Second, a growing number of studies have examined salary dispersion on team success. Building on both of these bodies of work, the current study estimates the impact of salary dispersion on the win probability of an NBA team leading *two minutes* before the end of a playoff game.

### 2.1 Sports Prediction Models

In 2012, 13% of the global gambling market was generated by sports betting, and in 2013, the online gaming market had a volume of \$37.6 billion (Statista 2014). Because of large potential financial gains, there are a vast number of studies that use a variety of methods to forecast professional sports game (see Gandar, et al. 2001). Clarke (1993) used an exponential smoothing technique to predict the outcome of Australian Rules football matches. He correctly predicted 70.3 percent of the games for the 1991 season. Using Bayes methodologies based on batting records early in the season, Brown (2008) predicted batting-average performance of baseball players in the 2005 season. His methods outperformed the naïve predictor which relied solely on the current average to predict. Dyte and Clarke (2000) used a Poisson regression to predict the number of goals scored by a team (country) during the 1998 FIFA World Cup tournament. The prediction was based on a subjectively modified FIFA ranking of teams to account for weaker teams from non-traditional soccer federations. Their prediction of 168.2 goals accurately estimated the actual 170 goals scored.

With regard to the NBA, Hu and Zidek (2004) used weighted likelihood to predict the winner of the 1997 NBA playoff finals between the Chicago Bulls and Utah Jazz. They used information from each team's home and away game performance in the regular season to predict the probability of the number of games it would take a team to win a playoff series. They compared the results of their *relevant* weighted likelihood model with that of a logistic model and found that the latter was superior to their model; however, the logistic method was less desirable for forecasting because it required a large number of parameters.

Many studies have found that a home-field advantage is significant in predicting a game's outcome (Clark 1993, Dyte and Clarke 2000, Gill 2000, Hu and Zidek 2004, Rue and Salvesen 2000). For instance in the NBA, home teams are estimated to come back and win 33.3 percent of the time while visiting teams do so only 10.5 percent of the time (Copper et al. 1992). Harville and Smith (2003) estimated the size of home-field advantage over a neutral field to be about four points in college basketball during the 1991-92 seasons. These findings highlight the importance of fans attendance of home games, which is popularly referred to as the Sixth Man. On the other hand, it also shows that a point difference of greater than four could nullify home-field advantage.

## **2.2 Salary Dispersion & Team Performance**

Empirical studies examining the relationship between salary dispersion and team performance have been conducted using NBA, Major League Baseball (MLB), National Hockey League (NHL), National Football League (NFL), Major League Soccer (MLS), and professional German soccer data. Katayama and Nuch (2011) summarize U.S. professional sports team studies that were conducted as of 2006. Across studies, the standard performance measure used was season winning percentage and the primary measure of salary dispersion was the Gini coefficient or the Herfindahl index. Overall, for MLB, studies find a negative relationship between salary dispersion and team winning percentage; however, for NBA and NHL, studies find mixed results (Katayama and Nuch 2011).

More recently, for NBA, studies continue to find mixed results. Simmons and Berri (2011) use data from the 1990 to 2008 seasons and expected pay dispersion as their measure of salary dispersion. In support of tournament theory (Lazear and Rosen 1981), they find that both team and player performances are

positively related to salary dispersion. Katayama and Nuch (2011) use game-level data from the 2002 to 2006 regular seasons and find no evidence that salary dispersion and NBA team performance are related.

Franck and Nuesch (2011) suggest that the mixed results of the previous empirical studies may be due to the examination of linear rather nonlinear effects of wage dispersion on team or firm performance. Using German soccer league data from 1995-96 to 2006-07 and two measures of dispersion (the Gini coefficient and the coefficient of variation), they allow for nonlinear effects in estimation. Overall, they find a U-shaped relationship between salary dispersion and team success which indicates that soccer teams in their sample appear to perform better when pay is structured at the extremes: steeply hierarchical or in an egalitarian manner. Coates et al. (2014) similarly allow for nonlinear effects of salary dispersion when examining MLS team performance during the 2005-2013 seasons. Salary dispersion is measured using the Gini coefficient and the coefficient of variation; however, the authors find a negative relationship between these measures and points per game which supports cohesion theory (Levine 1991).

Finally, Breunig et al. (2014) develop a model to examine the probability that an away MLB team wins the game. Using game-level data from 1985 to 2010 and probit estimation, they find a significant negative effect of own-team wage dispersion on the probability of winning games.

### 3 METHODS & DATA

- **Model**

Building on the work of Hu and Zidek (2004), Franck and Nuesch (2011), and others, we construct an empirical model that relates salary dispersion to win probabilities in NBA playoff games. The estimation controls for both *before-game factors* (e.g., regular season winning percentage) and *in-game factors* (e.g., point differences) (Hu and Zidek 2004). Using probit and logit, we estimate equations of the following form:

$$P(Y_i = 1) = f(\text{Salary}_i, \text{PCT}_i, \text{In-game}_i)$$

where  $Y$  equals 1 if the NBA team leading *two minutes* before the end of a playoff game wins the game. For ease of discussion, we denote this outcome as the “late game leader wins the game.” Salary is a vector of variables that include the coefficient of variation of the late game leader’s top 10 players’ salaries, this

variable squared, and the average of the late game leader's top 10 players' salaries. The variable PCT is the late game leader's win percentage during the regular season, and in-game is a vector of variables that includes the difference in points two minutes before the end of the game and a binary variable that equals 1 if the late game leader is the home team.

Unlike linear probability models, the probit and logit specifications impose 0–1 limits on the probabilities and allow the marginal effects to vary over the range of the explanatory variables. The probit model is a cumulative distribution function (CDF) of the standard normal distribution and the logit model is the CDF of logistic distribution. Because of the difference in their functional forms, the estimated coefficients are not comparable; however, the two models tend to have similar estimated marginal effects.

Our primary variable of interest is salary dispersion. If the estimated coefficients on the linear and squared terms are negative (positive), our results would suggest cohesion theory (tournament theory) more appropriately explains the relationship between NBA salary dispersion and win probabilities. Alternatively, if the relationship is U-shaped and consistent with Franck and Nuesch (2011), then the estimated coefficients on the linear and squared terms will be negative and positive, respectively.

In terms of our control variables, given a higher salary is commensurate with higher player quality, we expect that teams with higher average salaries will more likely be late game leaders that win games. Second, the late game leader's win percentage during the regular season captures a *before-game factor*. Teams are ranked and paired in the playoffs based on their win percentages. Thus, the win percentage measures the team's strength and position in standings, and we expect the estimated coefficient on this variable to be positive. Finally, both *in-game factors* are expected to positively influence win probabilities. That is, in terms of point differences, the larger is the point difference two minutes before the end of the game, the higher is the chance of the late game leader winning. If there is a tie on the two-minute countdown mark, then the difference is calculated after one team has taken the lead, and this team subsequently becomes the late game leader. In cases of overtime, the late game leader is still determined at two minutes before the end of regulation time. Playing at home is perceived to be an advantage; thus, we expect the sign on this variable to be positive. However, in NBA playoff series,

teams play the same opponent consecutively for at least four games. This together with elimination possibility provides incentives to game plan their opponents which could dampen home-field advantage. Table 1 provides a summary of the variables in our model.

- **Data**

The National Basketball Association (NBA) league is made up of 30 teams divided equally into two conferences, East and West. Each conference has three divisions, and each team plays 82 games with all other teams in both conferences. However, the number of games between any two teams depends on whether they are in the same division and/or conference. The teams are ranked by winning percentage. At the end of the regular season, the first eight teams in each conference qualify to play in the playoff season. The first round of the playoff games starts with the 1<sup>st</sup> team paired with the 8<sup>th</sup> team; 2<sup>nd</sup> with 7<sup>th</sup>, and so on. The winner of the best of seven games advances to the next round of the competition. The two conference champions play each other in the playoff finals for the national championship.

The data necessary to estimate the model was obtained from several sources including the ESPN 2012 and 2013 NBA Playoffs Play-by-Play and Team-by-Team Comparison, as well as, the NBA Player Salaries and Regular Seasons' Standing websites. NBA Playoffs Play-by-Play shows the score as well as major activities on the field in the course of the game. This was the source for the variables late game leader wins and difference in points two minutes before the end of the game. Most NBA games are characterized by several lead changes before the end of the game; therefore, the probability of winning would likely differ at various stages of the game. For example, if the leader at the beginning of the last quarter (e.g., last 12 minutes) is different from the leader at the beginning of the last two minutes, then the predictors' values would be those of the last quarter leader instead of the last two minutes leader. Hence, a different win probability would be expected. The variable win percentages is the number of games won in the preceding regular season with respect to total games played in the regular season and is not updated with playoff games. Teams are ranked by win percentages, and the higher ranked team plays four of the 7-game playoff series at home, if necessary. Although there are separate rankings for the east and west

conferences, the total games used in win percentages include those played against teams in both conferences.

Eighty-four and 85 games were played in the 2012 and 2013 playoff seasons, respectively, for a total of 169 observations. Means and standard deviations for all variables that are included in the regressions appear in Table 1. Out of the 169 games played in the two seasons, late-game leaders won 87.6% of them and played 65.1% of them at home. Moreover, on average, the late game leaders' win percentage during the regular season is 0.665, point difference two minutes before the end of the game is nearly 11 points, and average team salary is \$6.96 million. The coefficient of variation is calculated by dividing the standard deviation by the mean. The average coefficient of variation in our sample is 75.8%.

*Table 1* Descriptive Statistics

Variable	Description	MEAN	ST. DEV
<i>Outcome:</i>			
Y	Late game leader wins game (0-1)	0.8757	0.331
<i>Predictor:</i>			
CV	Coefficient of variation of late game leader's top 10 players' salaries	0.758	0.135
CVSQ	CV squared	0.593	0.016
S	Avg. salary of late game leader's top 10 players' salaries (US\$ mil)	6.96	0.104
PCT	Late game leader's win percentage during the regular season	0.665	0.080
D	Difference in points two minutes before the end of the game	10.562	8.199
H	Late game leader is the home team (0-1)	0.651	0.478

Late game leader is defined as the team that is ahead two minutes before the end of the game.

n = 169.

## 4 RESULTS

### 4.1 Estimation Results

Table 2 presents the probit and logit results. Overall, the results are similar for the two specifications; however, the marginal effects of the logit specification are slightly smaller in magnitude compared to the marginal effects of the probit specification. The McFadden R-squared is 0.25 for both specifications.

The signs on the estimated coefficients of the control variables are as expected. That is, a higher average team salary, a higher win percentage, a larger

difference in points two minutes before the end of the game, and playing at home all increase the likelihood that the late game leader wins the game. The estimated coefficients on win percentages and difference in points are statistically significant whereas those on average team salary and playing at home are not. The marginal effect of the difference in points for the logit specification indicates that given the mean values for the other variables, a one point additional lead increases the probability that the late game leader wins by 0.395.

The estimated coefficients on the coefficient of variation variables indicate a U-shaped relationship between salary dispersion and win probabilities; however, the results individually and jointly are not statistically significant. Thus, consistent with Berri and Jewell (2004) and Katayama and Nuch (2011), we conclude there is no evidence that salary dispersion and NBA win probabilities are related.

*Table 2* Probit and Logit Estimation Results

Variable	Probit		Logit	
	Est. Coef.	Marginal Effect	Est. Coef.	Marginal Effect
CV	-16.057 (10.946)	-1.478	-29.843 (20.937)	-1.288
CVSQ	9.425 (7.004)	0.867	17.448 (13.32)	0.753
S	0.136 (0.116)	0.013	0.246 (0.204)	0.011
PCT	0.111** (0.037)	0.010	0.199** (0.068)	0.009
D	4.836** (2.043)	0.445	9.160** (3.765)	0.395
H	0.124 (0.297)	0.011	0.288 (0.532)	0.012
Intercept	2.884 (4.115)		5.247 (7.981)	

Standard errors are in parentheses.

\*\*denotes statistically significant at the 5% level

## 4.2 Predicted Probabilities

Using the estimated coefficients from the probit and logit specifications in Table 2, the probability of the late game leader winning the game can be computed. Table 3 shows six estimated probabilities for three scenarios two minutes before the end of the game. In all the scenarios, it is assumed the late game leader is the home team. In scenario 1, the coefficient of variation, winning percentage, and average salary are kept constant at 0.90, 0.8, and US\$7 million, respectively. The predicted probabilities indicate that an increase in the point difference from 5 to 15

increases winning probability from 0.83 to 0.94. In scenario 2, holding all other factors constant, a 0.60 regular season winning percentage results in a winning probability of 0.56 whereas a 0.80 win percentage results in a 0.77 probability. The last scenario shows an increase in salary dispersion reduces winning probability. An increase of 0.3 in the coefficient of variation, *ceteris paribus*, yields a nine percentage points decrease in winning percentage. Finally, a comparison between “a” (scenario 1) and “f” (scenario 3) shows winning probability increases with salary.

**Table 3** Probabilities of Late-Game Leader winning the game

	Salaries Coef. of Variation	Salary (US\$ mil)	Point Difference (D)	Win Percentage	Probability
Scenario 1					
a	0.90	7.0	5	0.8	0.83
b	0.90	7.0	15	0.8	0.94
Scenario 2					
c	0.85	7.0	2	0.6	0.56
d	0.85	7.0	2	0.8	0.77
Scenario 3					
e	0.60	4.0	5	0.8	0.85
f	0.90	4.0	5	0.8	0.76

## 5 CONCLUSION

In this paper, we explored the relationship between wage dispersion and NBA win probabilities. Economic theory indicates the *a priori* relationship is ambiguous (Lazear and Rosen 1981, Levine 1991) and the existing empirical literature finds mixed results as to the direction of the relationship (Berri and Jewell 2004, Katayama and Nuch 2011, Simmon and Berri 2011). In our estimation, we allow for the relationship between wage dispersion and team performance to be nonlinear. Overall, our results indicate there may be U-shaped relationship between salary dispersion and win probabilities; however, the point estimates individually and jointly are not statistically significant. Thus, we conclude there is no evidence in our sample that salary dispersion and NBA win probabilities are related. These results are consistent with Berri and Jewell (2004) and Katayama and Nuch (2011).

It should be noted that an underlying assumption of this research is that salary structure is chosen to maximize game performance; however, given our results, it may be the case that salary structure is chosen instead to maximize NBA

franchise value. Currently, the New York Knicks (CV=0.99) are valued at \$1.4 billion whereas the Milwaukee Bucks (CV=0.49) are valued at \$405 million. Endorsements by professional athletes are a type of brand strategy (see Erdogan 1999, Ding et al. 2008), and although they are costly, can generate considerable value to the endorsing firm (Mathur et al. 1997, Farrell et al. 2000, Samitasa and Kenourgiosb 2008). To increase team revenues via attendance and team merchandise, franchise owners may hire a small number of superstars although it would create salary dispersion among the players.

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## BRAND LOYALTY – A DETERMINANT OF BRAND EQUITY

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**Abstract:** *The study aims to develop a model of brand equity for a Romanian women's clothing brand. The research aims are: (1) to investigate the relation between Brand Awareness/ Brand Associations/ Perceived Quality /Brand Loyalty and Brand Equity; (2) to investigate the relation between Brand Equity and Brand Value; (3) to investigate the relation between Brand Value, Purchase Intention and Consumer Willingness to pay a Premium Price. The research methods are the documentary study and the survey based on a quantitative questionnaire. The research sample consists of 120 respondents. The results showed that brand association and brand loyalty have a direct influence on brand equity, while awareness and perceived quality do not display a significant impact on overall brand equity.*

**Keywords:** *brand equity, brand loyalty, brand value, brand awareness, brand associations*

**JEL Classification:** *M20, M31*

### 1 INTRODUCTION

Brand equity and brand loyalty are two concepts that have managed to generate interest within the academic community for nearly three decades. As such, the specialized literature on the subject is quite extensive. However, if one looks at

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the origin of brand equity founders, it is enough to understand that the concept of brand equity is entirely US made. Recent years have seen various contributions in the field from around the world, with focus on developing scales reliable for cross-national validation and a global applicability, as well as applying various already validated scales in country-specific settings (Malaysia or Turkey). It can then be inferred that the field of brand equity is becoming increasingly globalized.

The Romanian environment, however is suffering from low awareness in regard to the concept of Brand Equity. In Romania, the term of brand equity is less-known than elsewhere around the world. There is not even a corresponding term for brand equity in the Romanian language. As such, brand equity research in the Romanian business environment is quite scarce, which is problematic in that, if managers are not aware of the concept, they cannot very well seek to apply it and subsequently gain valuable information which might help strengthen their brand and help their business.

The concept of brand loyalty is usually used to describe the repetitive buying process for a brand, this behavior being generated by the consumer's belief that a specific brand will satisfy his needs in the best way possible. Is it very important for a brand to generate customer loyalty, as this process involves both attitudinal and behavioral components? Brand loyalty is linked to brand reliability, credibility - honesty, commercial implications (Tugulea, 2014), involvement and satisfaction.

Considering the benefits companies can gain from building strong brands, we believe that Brand Equity and Brand Loyalty- as a component of Brand Equity- are two concepts definitely worth exploring, which is the aim of this paper.

The purpose of this research is to develop a model of brand equity for a Romanian women's clothing brand, built and maintained during the last two decades by the company which bears the same name.

The research objectives are:

- To investigate the relation between Brand Awareness/ Brand Associations/ Perceived Quality /Brand Loyalty and Brand Equity
- To investigate the relation between Brand Equity and Brand Value
- To investigate the relation between Brand Value, Purchase Intention and Consumer Willingness to pay a Premium Price

The study is focused on a Romanian women's clothing brand. The company designs and manufactures women's clothing, in a very wide range of products,

from casual-wear to formal-wear and from business attire to outfits. From confidentiality and privacy reasons, the name of the brand is not specified. The company was also involved in the research process and was very interested in the final results.

The research hypotheses are:

H1: There is a positive relation between Brand Awareness/ Brand Associations/ Perceived Quality /Brand Loyalty and Overall Brand Equity

H2: There is a positive relation between Overall Brand Equity and Overall Brand Value

H3: There is a positive relation between Overall Brand Value and Purchase Intention

H4: There is a positive relation between Overall Brand Value and Willingness to pay a Premium Price

## 2 BRAND EQUITY

### 2.1 Theoretical Conceptualization

The subject of Brand Equity generated great interest from the scientific community in the last three decades, with various and numerous contributions made in this direction, from conceptual framework development to marketing research practical applications.

In 1988, Lance Leuthesser noted that a precise, unanimously accepted definition of brand equity did not, in fact, exist (Leuthesser, 1988). Although several long and very productive years have passed since then, the situation today does not seem to be much different from that described by Leuthesser (1988).

In order to define brand equity, two major perspectives were identified: *the financial perspective* and *the customer (consumer-based) perspective* (Severi and Ling; 2013).

The first distinction between these two perspectives was made by Cobb-Walgren and Rubble (1995) and briefly recounted by Atilgan *et al.* (2005). Cobb-Walgren and Ruble propose that where manufacturers and retailers are mostly interested in the possible strategic implications of brand equity, i.e. brand strength, a company's investors, both present and potential, will find more appeal in a financial outlook of brand equity.

From **the financial perspective**, the evaluation of brand equity is done in accordance with the market value of a company's assets. Simon and Sullivan (1993) define financial brand equity as "*monetary value of the brand to the firm*", consisting of "*the incremental cash flows which accrue to branded products over unbranded products*". Those adhering to the financial perspective of brand equity, however, recognize that any value a brand might have and, as such, a company might benefit from, is a direct result of consumer responses to that particular brand. Consequently, the grand majority of brand equity research is focused on a consumer-based approach.

**The customer/consumer-based approach** suggests that the power of a brand stems from the minds of consumers. The two most notable authors who address consumer-based brand equity are David Allen Aaker (1996) and Kevin Lane Keller (2001). Both of these authors are considered pioneers in the area of theoretical conceptualization of brand equity and each of them has made invaluable contributions to the subject through their extensive studies. Most of the empirical research carried out in the field of brand equity is based on the studies of either Aaker or Keller.

As such, when defining consumer-based brand equity, it is essential to examine the studies of these two founders of the concept.

In his book, "Building Strong Brands" (1995: 23), David A. Aaker defines consumer-based brand equity as "*a set of assets (and liabilities) linked to a brand's name and symbol that adds to (or subtracts from) the value provided by a product or service to a firm and/or that firm's customers.*" There are five major asset categories identified by Aaker which need to be taken into consideration when attempting to measure brand equity, namely *Brand Name Awareness*, *Brand Loyalty*, *Perceived Quality*, *Brand Associations* and *Other Proprietary Assets*.

These five major asset categories identified by Aaker have subsequently acquired the name of Brand Equity Dimensions and have widely used in consumer-based brand equity measurement. Aaker (1995) propounds that brand equity be measured by combining consumer perception measures with market-performance measures. His definition of brand equity is included as an integral part of consumer-based brand equity, however, due to the fact that the grand majority of empirical studies following his model are aimed in this direction.

In 1993, Kevin Lane Keller (2001) introduced the term Customer-based Brand Equity in a paper that would shape the face of brand equity research for years to come. Keller (2001: 34) defines brand equity as “*the differential effect of brand knowledge on consumer response to the marketing of the brand.*”

## 2.2 Theoretical Models

Most brand equity research is conducted with consideration toward a selection of few conceptual models, with respect to which brand equity scales and measurements are developed. While researchers will often develop their own scales, specifically tailored to their area of focus and interest, the theoretical models they examine largely remain the same.

More specifically, most empirical studies aiming to measure brand equity are based on either the Aaker Model or on the Customer-Based Brand Equity Model developed by Keller.

**The Aaker Model** was introduced in 1991 by David A. Aaker. The model introduces five major asset categories, which require constant monitoring and investment on the company’s part if management of brand equity is to be successful. Managing brand equity effectively involves creating and enhancing these assets. The five major asset categories, or brand equity dimensions as proposed by Aaker are:

- (1) Brand Awareness – refers to the strength of a brand’s presence in the consumer’s mind and that can affect consumer perceptions and attitudes; Aaker goes on to identify several perspectives from which awareness can be identified and measured, namely Recognition, Recall, Top-of-mind, Brand Dominance, Brand Knowledge and Brand Opinion.
- (2) Brand Loyalty. Brand loyalty was defined as the repeating buying behavior of a product or a specific brand (LaBarbera, Mazursky, 1983, p. 395). This type of loyalty involves an emotional attachment while repeating the purchase can only mean the frequent acquisition of the same brand. The inclusion of this dimension in the brand equity model was extremely controversial, with most authors believing that loyalty to certain brand is an outcome of high brand equity, not a determinant; Aaker, however argues that Loyalty should be included as an equity-generating asset, as doing so justifies the adoption of loyalty-building programs which, in turn, enhance brand equity. A major issue in including Loyalty as a dimension of brand

equity applies to the actual measurement process, in that loyalty measures do not apply to non-consumers. In order to obtain consumer's loyalty, the brand must be perceived both warm and competent (Kervin et al., 2012; Andrei and Zait, 2014)

- (3) Perceived Quality – a very important component of brand equity as, according to Aaker (1991), among all brand associations, Perceived Quality is the only one to actually drive financial performance. Aaker argues that Perceived Quality should be measured in comparison to other brands, in terms of level of quality (high/average/inferior) and consistency of quality.
- (4) Brand Associations – might include product attributes, a particular symbol or a celebrity endorser/spokesperson. The levels of Brand Associations are Value, Brand Personality and Organizational Associations.
- (5) *Other Proprietary Assets* – include but are not limited to strong distribution channels for a brand and patents attached to a particular brand.

**The Customer-Based Brand Equity (CBBE) Model** was developed by Kevin Lane Keller (1993) and expanded upon in subsequent works. It provides insight into what brand equity is, as well as how this concept should be built, measured and managed.

Keller stresses out the importance of having strong brands (which have high brand equity) from the very beginning, i.e. building them from scratch, as attempting to change any one given aspect or dimension of brand equity with consumer-perceived low value might result in the brand losing ground in another one of its dimensions. The example of lowering prices as a means of achieving higher market share, while sacrificing the existing customer base is provided.

According to Keller (2001), building a strong brand (with the aid of the CBBE Model) is important due to the many benefits a company will gain from doing so. Among these benefits, the following are listed: less vulnerability to market crises, increased effectiveness of marketing communications, as well as increased customer loyalty. Greater customer loyalty is, therefore, identified as a benefit of brand strength and a direct result of brand equity. Keller's view on Brand Loyalty is thus in direct conflict with that of Aaker.

Keller's view of brand equity as a means to building a strong brand entails following a series of steps (four to be more precise), with each of these steps outlined as being dependent upon the successful implementation of the previous step. An exception to this rule would be the very first step as introduced by Keller

as the first step has no previous step. Like the brand equity dimensions, the steps are organized and presented in a pyramid shape and model, also referred to as the “branding ladder”.

The four steps identified by Keller (2001) involve answering a series of four questions, each of which is directly related to one Brand Equity Dimensions of the CBBE Model: 1. Identity (Who are you?); 2. Meaning (What are you?); 3. Response (What about you?); 4. Relationships (What about you and me?).

### **2.3 Brand Equity Measurement**

When it comes to measuring brand equity, whether from a financial perspective or a consumer-based one, most researchers will base their studies on a theoretical model found in the literature. For the consumer-based brand equity perspective, examples of such studies based on one of the two previously presented models include:

- Keller’s CBBE Model in Park (2009), Kuhn et al. (2008);
- The Aaker Model: Gill and Dawra (2010); Severi and Ling (2013); Buil (2013); Atilgan (2005); Yoo (2000) just to name a few;
- Both of the previous models: James (2006).

When it comes to brand equity measurement scales, the generally accepted practice within literature shows individual researchers either developing their own set of scales or, more commonly, employing and adapting scales which have been previously validated in the literature. Either way, the scales used by the brand equity research community are specifically tailored to the nature of the research at hand and the precise product category serviced by the brand in question.

While it is very uncommon to find the same scales utilized in different contexts, there is a selection of few sets of brand equity scales which have been found to generate reliable results, which can be adapted to most any product category. Such scales can be found in the studies of Yoo *et al.* (2000), Pappu *et al.* (2005), Aaker (1996) and Lassar *et al.* (1995).

The scale for brand equity measurement developed by Yoo, Lee and Donthu (2000) was validated by Washburn and Plank (2002) and is, at present the most commonly accepted measure of brand equity, from a consumer-based perspective. The scale developed by Yoo *et al.* initially consisted of 19 items specifically aimed at the four brand equity dimensions proposed by Aaker (comprising

Multidimensional Brand Equity), as well as a new equity construct, titled Overall Brand Equity (OBE), which was developed by the authors, in accordance with what they perceived to be acceptable definitions of brand equity; 5 of 14 initially proposed brand equity items were deleted during the scale validation process (generated low alpha values during factor analysis). The 14 remaining items are measured on one to five Likert-type scales; anchors range from 1, indicative of a strong level of disagreement (“Strongly Disagree”) and 5, representing a high level of agreement (“Strongly Agree”).

As one of the most widely used measurement scales in brand equity research, the scale proposed by Yoo, Donthu and Lee (2000) is briefly presented in Table 1. The authors put forward that brand equity be measured based on two constructs, namely Multidimensional Brand Equity, which encompasses the four dimensions envisioned by Aaker, and Overall Brand Equity, which is meant to provide an accurate measure of what consumers perceive a brand’s equity to be.

**Table-1** Brand Equity Scale introduced by Yoo, Donthu and Lee (2000)

<b>Brand Equity Construct</b>	<b>Brand Equity Dimension</b>	<b>Scale Item</b>
<i>Multidimensional Brand Equity (MBE)</i>	<i>Perceived Quality</i>	The quality of X is extremely high. The likelihood that X would be functional is very high.
	<i>Brand Loyalty</i>	I consider myself to be loyal to X. X would be my first choice. I will not buy other brands if X is available at the store.
	<i>Brand Awareness</i>	I can recognize X among other competing brands. I am aware of X.
	<i>Brand Associations</i>	Some characteristics of X come to my mind very quickly. I can quickly recall the symbol or logo of X. I have difficulty imagining X in my mind.
<i>Overall Brand Equity (OBE)</i>		It makes sense to buy X instead of any other brand even if they are the same. Even if another brand has the same features as X, I would prefer to buy X. If there is another brand as good as X, I prefer to buy X. If another brand is not different from X in any way, it seems smarter to purchase X.

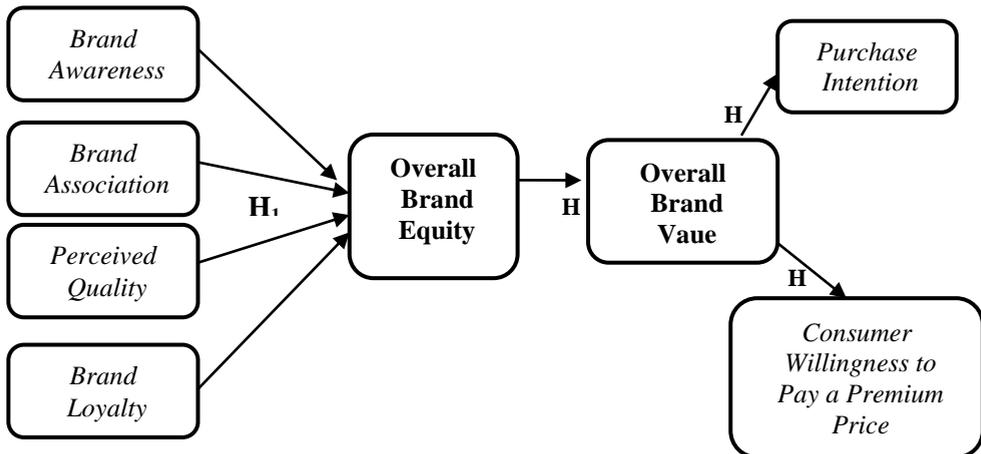
Source: Yoo, Donthu and Lee: 2000

### 3 RESEARCH METHODOLOGY

#### 3.1 Research Methods

The research combined documentary study with quantitative survey.

As part of the exploratory phase of research, a literature review was conducted. It is this review that has led to the development of the brand equity model. The brand equity model developed for the purpose of this study is based on the Aaker model (determinants of brand equity include **Brand Awareness**, **Brand Associations**, **Perceived Quality** and **Brand Loyalty**) with the addition of **Purchase Intention** and **Consumer Willingness to pay a Price Premium** as proposed outcomes of brand equity. A construct intended to measure Overall Brand Equity (Yoo, 2000) is also an integral part of the model. The model was adapted from the study of Buil, Martinez and de Chernatony (2013) and is to be presented, in graphical form bellow, in Figure 1. All depicted arrows indicate assumed positive relationships between the dimensions.



**Figure-1** Proposed Customer-Based Brand Equity Model

The research hypotheses were formulated based on the study of previous research in this field.

H1: There is a positive relation between Brand Awareness/ Brand Associations/ Perceived Quality /Brand Loyalty and Overall Brand Equity

H2: There is a positive relation between Overall Brand Equity and Overall Brand Value

H3: There is a positive relation between Overall Brand Value and Purchase Intention

H4: There is a positive relation between Overall Brand Value and Willingness to pay a Premium Price

The relations between these variables were investigated using data collected through a quantitative survey based on a self-administered questionnaire serving as research instrument.

### 3.2 Research Sample

The population of interest for this particular research problem consists of consumers who have had recent experience with the brand and the products sold under this brand. Actual purchase of the products in the recent 12 months was introduced. The research sample consists of 120 women respondents. 10% of total respondents have been excluded from participation in the study as a result of not meeting the eligibility criteria. 33.3% of the women are 25-34 years old and 20% of them have ages between 35-44 years.

### 3.3 Research Instrument

The questionnaire was applied online, by means of Google forms and was sent by the Marketing Department of the company to their existing client base. The questionnaire was available in Romanian, over a two-day period, in the month of June, 2014. Table 2 presents the scales used for each construct, developed based on literature review. Each item is evaluated on a 5 point Likert scale, from *Total agreement* to *Total disagreement*. The items from the questionnaire contained also the name of the brand but we replace the name with dots, intending to protect the company's confidentiality.

*Table-2* Constructs and scales

Constructs	Scale Item
<i>Brand Awareness</i>	I am able to associate the ... brand with the clothing products market.
	... is a clothing brand I am very familiar with.
	When I think about clothing products, ... is the first brand that comes into my mind.
	When I think about clothing products, ... is one of the brands that come into my mind.
<i>Brand Associations</i>	I can easily recall the ... logo.
	I think ... has created for itself a strong image in the eyes of the consumers.

Constructs	Scale Item
<i>Perceived Quality</i>	I think ... matches my personality.
	I think ... is different, in a good way, from competing brands.
	I can always trust in ... if I want a quality clothing product.
	... offers very good quality clothing products.
	... always offers quality clothing products.
	... offers clothing products which have attractive prices.
	During use ... products are highly unlikely to be defective.
	... offers clothing products made from fabrics which are of better quality than anything else on the market.
	... offers clothing products which have an attractive design.
	I think a ... purchase is a good investment.
<i>Brand Loyalty</i>	... offers superior product quality when compared to what else is available on the market.
	I consider myself to be loyal to ....
	I always buy ... products.
	I buy ... products much more often than I buy products offered by other clothing brands.
<i>Consumer Willingness to Pay a Price Premium</i>	If I were to recommend clothing products, ... would be the first brand I would recommend.
	I recommend ... to my acquaintances, family and friends as often as I can.
<i>Purchase Intention</i>	The prices of ... products would have to go up quite a bit before I would consider not buying their products.
	I am willing to pay a higher price for ... clothing items than I would pay for similar products offered by other brands.
	I am seriously considering buying ... clothing.
<i>Overall Brand Equity</i>	It is very likely that I will purchase ... clothing in the future.
	It is very likely that I will purchase ... clothing in the following 3 months.
	I would buy ... instead of any other brand, even if they are similar in terms of product quality.
<i>Overall Brand Value</i>	I would buy ... instead of any other brand, even if they are similar in terms of product price.
	Even if another brand is as good as ..., I prefer to buy ... clothing.
	In my opinion the overall value of .... is:

## 4. RESULTS

### 4.1 Dimensions Scores

In order to investigate consumers' perception regarding the dimensions included in the model, we computed a score for each of the dimensions. The results are presented in Table 3.

The scores presented in column 2 of Table 3 were computed by averaging all consumer responses for each of the 36 variables; the scores presented in column 3 were computed by averaging the scores obtained by all variables comprising a specific brand equity dimension.

These scores provide a first, basic outlook into the equity assigned by consumers to the investigated brand. The highest equity consumer-attributed values are 3.8 assigned to Overall Brand Value and Perceived Quality, while the lowest is 2.9 attributed to Willingness to Pay a Premium Price.

**Table-3** Descriptive Statistics by Brand Equity Dimension

<b>Brand Equity Dimensions</b>	<b>Variable Score</b>	<b>Dimension Score</b>
<i>Brand Awareness</i>	4.14	<b>3.63</b>
	3.52	
	3.10	
	3.78	
<i>Brand Associations</i>	3.69	<b>3.6</b>
	3.69	
	3.43	
	3.73	
<i>Perceived Quality</i>	3.91	<b>3.8</b>
	4.07	
	3.93	
	3.50	
	3.70	
	3.70	
	3.80	
	3.80	
<i>Brand Loyalty</i>	3.1	<b>3.2</b>
	2.8	
	3	
	3.4	
	3.6	
<i>Consumer Willingness to Pay a Premium Price</i>	3	<b>2.9</b>
	2.8	
<i>Purchase Intention</i>	3.5	<b>3.6</b>
	3.9	
	3.4	
<i>Overall Brand Equity</i>	3.3	<b>3.3</b>
	3.3	
	3.4	
<i>Overall Brand Value</i>	3.8	<b>3.8</b>

A very basic inference which can be made based on these scores alone, suggests while Perceived Quality may, in fact, directly and positively impact the

overall consumer-perceived value of the brand, said brand value does not positively impact Consumer Willingness to pay a Premium Price. An in-depth analysis of the relationships hypothesized Figure 1 will be conducted by means of regression analysis.

#### **4.2 Regression Analysis between Brand Awareness, Brand Associations, Perceived Quality, Brand Loyalty and Overall Brand Equity**

For the purpose of testing the proposed research model (Figure 1) and verifying the hypotheses associated with the model, regression analysis was run.

A very first step towards employing regression analysis was undertaken by computing new variables representing each brand equity dimension proposed in the model. These dimensions of brand equity were computed with Transform – Compute Variable option in the SPSS Statistics menu by computing the averages of scores given to each variable associated with a respective brand equity dimension. All of the 30 ratio variables were transformed into 7 new variables, which are to be tested with regression analysis. The 31 ratio variable (B\_value) to be measured was kept the same, as there was only one item used to measure it.

As per the first hypothesis, it is at this stage in the research process assumed that there is a positive linear relationship between each of the four brand equity dimensions proposed by Aaker and overall brand equity. As such, a linear regression model is run with SPSS Statistics, version 17.0, with overall brand equity as a dependent variable, and the four proposed determinants as independent variables.

The coefficient of determination (R) is 0.813 and indicates strong relationship between the dependent variable – Overall Brand Equity and the chosen independent variables (Brand Awareness, Brand Associations, Perceived Quality and Brand Loyalty). The coefficient of correlation is 0.661 and suggests that 66.1% of the variation of overall brand equity can be explained by the simultaneous variation of the chosen independent variables.

**Table-4** Anova Analysis

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	76.256	4	19.064	50.119	.000 <sup>a</sup>
	Residual	39.179	103	.380		
	Total	115.435	107			

a. Predictors: (Constant), brand\_loyalty, brand\_awareness, brand\_associations, perceived\_quality

b. Dependent Variable: overall\_BE

The ANOVA table (Table 4) indicates that the linear regression model run with overall brand equity as a dependent variable is statistically significant. This particular inference can be drawn from both the level of significance (sig.=0.000, which is smaller than  $\alpha=0.05$ ) as well as by doing a quick Fisher test. The F value is 50.119 for sig.=0.000, indicating that the model is significant.

It can, therefore, be inferred that the linear regression model between Overall Brand Equity and all of the four independent variables is significant.

However, even though it can be concluded, with a probability of 95% that this regression model is significant, a quick look at the Coefficients table (Table 5) reveals problems with three of the four estimated regression coefficients, corresponding to Brand Awareness, Brand Association and Perceived Quality. With sig. values higher than  $\alpha=0.05$ , the results yielded by this model are not applicable to the entire population of interest.

**Table-5** Regression coefficients

Model	Non-standardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	.024	.380		.062	.951
brand_awareness	.110	.117	.081	.938	.350
brand_associations	.149	.139	.122	1.075	.285
perceived_quality	.119	.179	.077	.665	.507
brand_loyalty	.606	.093	.599	6.542	.000

In order to shed some light into the aforementioned problem, backward regression is run for these five variables. The results of backward regression indicate that although, to some extent, linearly related to overall brand equity, the total variation in brand awareness and perceived quality is insufficient in explaining the variation in brand equity. In fact, the combined variations of these

two variables only determine 0.05% of the variation of the dependent variable and, as such, are to be excluded from the model. Ultimately only brand associations and brand loyalty explain the total variation in Overall Brand Equity, with the value of  $R^2 = 0.656$ , indicating that 65.6% of the variation of Overall Brand Equity can be explained by the simultaneous variation of the brand associations and brand loyalty.

Analysing the regression coefficients presented in Table 6, we conclude that the mathematical representation of the model can be, thus written as:

$$\text{Overall Brand Equity} = 0.331 + 0.256 \times \text{Brand Associations} + 0.655 \times \text{Brand Loyalty}$$

As a result, the first hypothesis is only **partially confirmed** ( $H_1$ : *There is a positive relation between Brand Awareness/Brand Associations/Perceived Quality/Brand Loyalty and Overall Brand Equity*), with awareness and perceived quality not having a significant impact on overall brand equity.

**Table-6** Regression coefficients for the three models

Model	Non-standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
• (Constant)	.024	.380		.062	.951
brand_awareness	.110	.117	.081	.938	.350
brand_associations	.149	.139	.122	1.075	.285
perceived_quality	.119	.179	.077	.665	.507
brand_loyalty	.606	.093	.599	6.542	.000
• (Constant)	.176	.302		.583	.561
brand_awareness	.119	.116	.087	1.027	.307
brand_associations	.203	.112	.166	1.814	.073
brand_loyalty	.629	.086	.621	7.291	.000
• (Constant)	.331	.262		1.264	.209
brand_associations	.256	.100	.209	2.575	.011
brand_loyalty	.655	.082	.647	7.961	.000

### 4.3 Regression Analysis between Overall Brand Equity and Overall Brand Value

In order to ascertain the validity of the second hypothesis ( $H_2$ : *There is a positive relation between Overall Brand Equity and Overall Brand Value*) a linear regression model is run.

With  $R^2=0.604$ , the total variation of Overall Brand Equity explains 60.4% of the total variation in Overall Brand Value. The estimated equation for this model is given below:

$$\text{Overall Brand Value} = 1.580 + 0.657 \times \text{Overall Brand Equity}$$

An increase of 1 point in overall brand equity will generate an increase of 0.657 in overall brand value.

The results of the regression model previously summarized indicate a positive linear relationship between overall brand equity and overall brand value. As such, the second hypothesis ( $H_2$ : *There is a positive relation between Overall Brand Equity and Overall Brand Value*) is **confirmed**.

#### **4.4 Regression Analysis between Overall Brand Value and Purchase Intention**

The nature of the relationship between overall brand value and consumer purchase intention constitutes the basis for the third proposed hypothesis ( $H_3$ : *There is a positive relation between Overall Brand Value and Purchase Intention*). In order to test the accuracy of this hypothesis a regression model between the two previously mentioned variables was made so as to assess the nature of the relationship between the two variables.

The total variation in overall brand value explains 50.9% of the variation in purchase intention. The model is statistically significant, as indicated by all sig. values associated with its coefficients (sig. =0.00<0.05).

The estimated equation for this model is:

$$\text{Purchase Intention} = 1.116 + 0.653 \times \text{Overall Brand Value.}$$

An increase of 1 point in overall brand value will result in an increase by 0.653 points in consumer purchase intention.

The model suggests a significant positive relationship between these two variables, with purchase intention as the dependent variable, thereby **confirming** the third hypothesis.

#### **4.5 Regression Analysis between Overall Brand Value and Consumer Willingness to Pay a Premium Price**

As a means of testing the fourth hypothesis ( $H_4$ : *There is a positive relation between Overall Brand Value and Willingness to pay a Premium Price*), a linear regression model was run with Overall Brand Value as the independent

variable and Consumer Willingness to Pay a Premium Price as the dependent variable to be explained.

Regression analysis suggests a medium-strength relationship between the two variables, with the total variation in consumer willingness to pay a price premium being explained to the extent of 31.1% by the total variation in overall brand value.

The estimated equation for this model is:

*Consumer Willingness to Pay a Premium Price* = 0.222 + 0.708 x  
*Overall Brand Value*

From this equation (and the coefficients associated with each variable) we can infer that when overall brand value has a value of 1 point, consumer willingness to pay a price premium increases by 0.708 points.

All sig. values generated by SPSS (for both ANOVA and coefficients tables) indicate a significant model, and as such a positive linear relationship between overall brand value and willingness to pay a price premium.

Consequently, the fourth and final research hypothesis is **confirmed**.

## 5 CONCLUSIONS

Based on studies previously found in literature, a brand equity model was put forward. This model included 8 brand equity variables and made hypotheses in regards to the nature of the relationships between various sets of variables, which were then translated into a total of four research hypotheses. The scores obtained for each equity dimension range from 2.9 to 3.8, where the minimum value which could have been obtained was 1 and the maximum could have been 5.

The average for the scale measuring *Consumer Willingness to Pay a Premium Price* is 2.9. This dimension speaks towards the consumers' willingness to accept price variations for the brand.

The average for the scale measuring *Brand Loyalty* is 3.2, indicating the value of the extent to which consumers themselves display brand loyalty and recommend it within their social circles.

The average value for the scale *Overall Brand Equity* is 3.3. This dimension aims at providing an overall value of brand equity.

The average for the scale measuring *Brand Associations* is 3.6. This scale measures the extent to which the image of the brand is considered to be a match by the respondents, both in terms of image and style.

The average value of consumer's intention to purchase the brand in the future (the scale for *Purchase Intention*) is 3.6, indicating a medium level of interest in this direction.

The extent to which consumers know what the brand stands for (the scale for *Brand Awareness*) is 3.63, indicating a good level of brand awareness.

The *Perceived Quality* of Brand and Product is evaluated with the average of 3.8; this value shows us that consumers perceive a good quality of the brand.

Consumer-assigned *Brand Value* is 3.8. This dimension aims at capturing an overall view and consumer opinion of the brand in question.

Research findings with respect to the four hypotheses include:

- *H<sub>1</sub>: There is a positive relation between Brand Awareness/ Brand Associations/ Perceived Quality /Brand Loyalty and Overall Brand Equity* – hypothesis was only **partially confirmed**; based on the collected data, positive, linear relationships were found between brand associations and brand loyalty, when regressed upon overall brand equity; it was further determined that awareness and perceived quality had an indirect positive impact on Overall Brand Equity, the nature of which will be presented below shortly;

- *H<sub>2</sub>: There is a positive relation between Overall Brand Equity and Overall Brand Value* – **confirmed**

- *H<sub>3</sub>: There is a positive relation between Overall Brand Value and Purchase Intention* - **confirmed**

- *H<sub>4</sub>: There is a positive relation between Overall Brand Value and Willingness to pay a Premium Price*- **confirmed**

It was inferred that associations and perceived quality, rather than directly influencing brand equity, play an indirect part in ascertaining consumer-perceived brand equity by influencing brand awareness and loyalty, which in turn directly impact and determine brand equity. The relationship between brand equity and brand value is linear and positive in nature, meaning that high brand equity automatically generates higher brand value. It is this brand value that determines the extent to which consumers are willing to tolerate price increases for the brand as well as future purchase intentions specific to the brand in question.

### **Research Limitations**

Having been applied in an online format, as well having allotted a rather small timeframe for data collection, it is unlikely that all of the target population had access to the questionnaire form, which is reflected in the fact that the “Over

54 years old” market segment is not at all represented in the study. It can therefore be inferred that the results obtained do not apply to the entire population of interest. Other limitations include a relatively small sample size that might impact the results.

### **Future research directions**

All of these findings were however generated by examining the responses and attitudes of brand users and at-one-time brand owners. An idea for further, complementary research is to apply the brand equity model to non-users and non-owners so as to gather information regarding why they do not consider the investigated brand as a viable option in product purchase situations. Such an endeavor has already been undertaken (Tolba, 2009) with positive and insightful results. Using more complex statistical methods such as factor analysis and structural equation modeling is yet another idea for further research.

### **Managerial Implications**

Based on the scores alone, it can be inferred that both equity and value for the brand are above average. With scores of 3.3 and 3.8 respectively, it can be inferred that consumers perceive the brand to be of good quality and worth investing in.

However, although in essence addressing a certain type of lady based on the products that it designs and offers to consumers, the brand needs to redouble its efforts in attracting the younger demographic, possibly through another brand extension. It is obvious from the data gathered that the younger demographic does not, in fact, harness the same enthusiasm towards the brand as the older one.

The company’s management needs to find a way to provide more attractive benefits to these younger consumers, without in any way, shape or form chasing away their older ones. As things stand now, older consumers are this company’s bread and butter, and the reason the brand achieved its high values in terms of both equity and overall value.

### **ACKNOWLEDGEMENT**

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# INTERNATIONAL PRICES, MONETARY AND INCOME SHOCKS: A SVAR MODEL OF THE EXTERNAL TRADE CHANNEL IN AFRICAN ECONOMIES

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**Abstract:** *We study the effects of international monetary, income and prices shocks on domestic income through the external trade channel in 16 African countries between 1970 and 2012, using a SVAR Model. The results emphasize that domestic income is exposed to international shocks through the impacts of these shocks on export and import flows of goods and services. The intensity of this exposure depends on the transmission channel, type of external shock, specialization of each country and domestic public policies. All the countries of the sample are at least exposed to one international shock. 13 countries are exposed to real GDP OECD per capita shock, 10 countries to harmonized inflation in OECD countries. Of 7 countries that export oil products, 3 are exposed to world prices of oil through the exports channel. 5 countries are exposed to this variable through the imports channel. Only 4 countries of the sample are exposed to the FED monetary policy. Moreover, the results for domestic variables in the income equations suggest that countries impacted by an external shock could use these variables to sustain economic growth (i. e. increase public expenditure in general and investment in human and physical capital in particular).*

**Keywords:** *African economies, international prices shocks, international income shocks, FED monetary policy international transmission, external trade channel, SVAR model*

**JEL Classification:** *C22; F14; F43; O11.*

## 1 INTRODUCTION

Openness of contemporary economies to financial and globalized goods and non-financial services flows lead to economic interdependencies and exposure to "shocks" in financial and trade partner countries. The exposure of Developing Countries to international financial and economic shocks is particularly obvious. African Countries for instance essentially produce and export raw materials toward

advanced and emerging economies (Madeley, 2003), and import finished products. A major international crisis has a large impact on these countries because of this external specialization (Berman and Martin, 2012). The recent global crisis is a good example of fluctuations in external trade in Africa during periods of crises. Exports represent 37% of African real GDP in 2008 and decrease to 30% in 2009. Imports decrease from 41% to 34% and rise again up to 37% in 2011. The share of external trade in real GDP in Africa decreases between 2008 and 2009, from 77% to 66% (World Development Indicators). Fluctuations in commodity prices also have a large impact on African economies. Between 2008 and February 2009, the world price of oil decreases of 50%, and the prices of copper, coffee, cotton and sugar decrease of 20% (IMF, 2010).

Many studies of the exposure of Developing Countries to international economic and financial conditions show two types of transmission channels: financial and real (tourism, exports and imports of goods and services). Our study focuses on the trade channel, for which recent empirical studies validate the existence of a significant link between external trade and income in Developing Countries (Dutta and Ahmed, 2004; Thurlow, 2007; Mbabazi et al. 2008; Fernandez Puente et al. 2009), and between external trade and international financial and economic conditions (Berman and Martin, 2012). Thus, external flows of goods and services can generate a contagion of international "shocks" in Developing Countries.

These recent studies analyze the impact of either international shocks on external flows of goods and services, or external trade on income. We extend this existing literature by developing a theoretical (based on Assoumou Ella and Bastidon Gilles, 2013) and an empirical model that measure the fluctuations of domestic income caused by the impacts of international income and prices shocks on exports and imports. We test this model in 16 African countries, using the structural vector autoregression (SVAR) methodology. The SVAR models are particularly suitable to account for the transmission of international shocks, since they transform the correlated innovation series contained in the vector of residuals into a vector of orthogonal (independent) structural shocks that can economically be interpreted.

Our results confirm that all the countries of the sample are at least exposed to one international shock, most of time real GDP OECD per capita shock (13

countries), and harmonized inflation in OECD countries (10 countries). 3 countries are exposed to world prices of oil through the exports channel and 5 through the imports channel. Only 4 countries of the sample would be exposed to the FED monetary policy. Moreover, the results for domestic variables (public expenditure in general, investment in human and physical capital) show a positive and significant correlation with economic growth

Finally, our contribution is threefold. First, we establish and measure with a SVAR model the link between international income and prices shocks and domestic income *via* the external trade channel. Secondly, we provide country-level results for 16 countries, derived from an original database, when the existing literature usually provides one-country or panel studies. Thirdly, the results for domestic variables show that there is still a rationale for public policies sustaining growth in developing countries, which is not a minor concern after a large global crisis that has generated a massive return of fiscal policy stimulus in advanced economies. The paper is organized as follows: the survey about the dependence to external trade of income in Developing Countries and the accurate model to characterize the exposure of these countries to international income, monetary and prices shocks are exposed in section 2. In Section 3 the SVAR Model is individually tested in 16 African countries.

## 2 SURVEY AND THEORETICAL MODEL

Economic theory suggests the existence of a positive link between external trade and economic growth. The classical and neoclassical approaches explain this effect by the comparative advantages in terms of factor endowments or differences in technology. Endogenous growth models take into account the fact that external trade promotes the diffusion of knowledge and foreign direct investments and increases market size, promoting the realization of economies of scale. Thus, many Developing Countries opened gradually their economies to external trade in order to exploit this development opportunity. The Asian Developing Countries were first to open their economies in the 1960s and 1970s, and the African and South American Developing Countries did the same during the 1980s (Leyaro and Morrissey, 2010).

In the recent empirical literature, the positive link between external trade and income is validated, taking into account the specific characteristics of developing

economies. Different approaches include the public policy and business environment in each country (Baldwin, 2003); ecological, cultural, geographic and demographic characteristics (Foster, 2008; Dufrénot et al. 2009); as well as the levels of initial development (Kim and Lin, 2009). The purpose of this section is to present these recent works and the theoretical model of the exposure of income in Developing Countries to international income and prices shocks through the external trade channel.

The papers of Dutta and Ahmed (2004) and Mbabazi et al. (2008) are recent examples that validate the positive relationship between external trade and income, respectively in the particular case of the industrial sector in Pakistan and general case of a panel of 44 Developing Countries. The results of Dutta and Ahmed (2004) show a significant long-run causality between real exports of goods and services, the decrease in import tax, and industrial value added. The economic domestic income is impacted according to the share of the industrial sector in real GDP in Pakistan. The empirical study of Mbabazi et al. (2008) focuses on the relationship between openness, domestic income and inequality. The authors show that openness and investment in physical and human capital positively cause income in the countries of the sample. Inequalities, trade barriers, natural resources (raw materials) and geographical location in Africa (tested as a dummy variable) have a significant negative effect on income. In addition, trade liberalization reduces the negative effect of inequality on economic growth.

The study of Leyaro and Morrissey (2010), based on a panel of 136 Developing Countries, confirms the significant relationship between external trade and income, and the peculiarity of African countries for which the link is less important in comparison with the other countries of the sample, because they are specialized in the export of raw materials and have higher transportation costs.

The analyses of Fernandez Puente et al. (2009), Thurlow (2007) and Berman and Martin (2012) specifically concern African economies. Fernandez Puente et al. (2009) use the Generalized Method of Moments in a panel of 22 countries. Their results suggest that foreign trade and the openness index have a significant positive effect on income in the countries of the sample. For example, a 10% increase of exports increases domestic income of 0.14%. However, Thurlow (2007) examines the relationship between trade liberalization and pro-poor growth in South Africa and shows that economic openness conduces to the increase of exports and imports

in this country, but does not generate pro-poor growth. The results suggest that trade liberalization increases domestic income and also income inequalities.

Concerning the exposure of African countries to the global international crisis through the external trade channel, Berman and Martin (2012) show that it affects foreign trade by the "price effect" (prices in the crisis country, and therefore exports prices decrease) and the "income effect" (the decrease of income and household consumption in periods of crises in industrial countries reduce the demand of raw materials). If the study of Berman and Martin (2012) is necessary to analyze the effect of international economic and financial crises on external trade in Africa, it is not sufficient to characterize the fluctuation in domestic income caused by this exposure. In this context, our tests are based on a theoretical model of the impacts of international income and prices shocks on African economies through export and import channels. The assumptions of the model are exposed below:

H1: The world is composed of two countries: a developing country (B) that exports raw materials, and an advanced economy (A);

H2: There is a positive relationship between external trade and income in (B);

H3: Shocks in (A) impact exports and imports in (B);

H4: (B) is composed of an exposed sector represented by external trade variables, and an unexposed sector, namely Z.

Using H1 and H4, the income in (B) in period  $t$  can be written in this form:

$$Y_t = x_t^{\alpha_1} * m_t^{\varphi_1} * Z_t^{\beta}, \quad (1)$$

$Y$  represents income,  $x$  exports,  $m$  imports,  $Z$  the unexposed sector,  $\alpha_1$  the elasticity of  $Y$  with respect to  $x$ ,  $\varphi_1$  the elasticity of  $Y$  with respect to  $m$ , and  $\beta$  the elasticity of  $Y$  with respect to  $Z$ .

Using H3, exports and imports in (B) can be written in this form:

$$x_t = \dot{Y}_t^{\alpha'_1} * p_{pt}^{\sigma_1} * \dot{r}^{\tau'_1} \quad (2)$$

$$m_t = \dot{Y}_t^{\varphi'_1} * \dot{p}_t^{\rho_1} * \dot{r}^{\tau_1} \quad (3)$$

$\dot{Y}$  represents income in (A),  $p$  commodity prices,  $\dot{p}$  inflation in (A),  $\alpha'_1$  the elasticity of  $x$  with respect to  $\dot{Y}$ ,  $\sigma_1$  the elasticity of  $x$  with respect to  $p_p$ ,  $\varphi'_1$  the elasticity of  $m$  with respect to  $\dot{Y}$  and  $\rho_1$  the elasticity of  $m$  with respect to  $\dot{p}$ ,  $\dot{r}$  the central bank of (A) official interest rate, with  $\tau'_1$  the elasticity of  $x$  with respect to  $\dot{r}$  and  $\tau_1$  the elasticity of  $m$  with respect to  $\dot{r}$ .

Using equations (1), (2) and (3), we have:

$$Y_t = e^{\dot{Y}_t^{(\alpha_2 + \varphi_2)}} * \dot{p}_t^{\rho_2} * p_{pt}^{\sigma_2} * \dot{r}^{(\tau'_2 + \tau_2)} * Z_t^\beta \quad (4)$$

With  $\alpha_2 = \alpha_1 * \alpha'_1$ ,  $\varphi_2 = \varphi_1 * \varphi'_1$ ,  $\rho_2 = \rho_1 * \varphi_1$ ,  $\sigma_2 = \sigma_1 * \alpha_1$ ,  $\tau'_2 = \alpha_1 * \tau'_1$  and  $\tau_2 = \alpha_1 * \tau_1$

According to (4), the impacts of an income shock in (A) on income in (B) through the exports and imports channels are respectively  $\alpha_2$  and  $\varphi_2$ . The effects of a price shock in (A) and commodity prices shock on income in (B) through the imports and exports channels are respectively  $\rho_2$  and  $\sigma_2$ , and the impact of monetary shocks are  $\tau'_2$  and  $\tau_2$ . In this context, we estimate  $\alpha_1, \alpha'_1, \varphi_1, \varphi'_1, \rho_1, \sigma_1, \tau'_1$  and  $\tau_1$ , and then multiply them according to equation (4) in order to get  $\alpha_2$  and  $\varphi_2$  (the impacts of an income shock in (A) on income in (B) through the exports and imports channels),  $\rho_2$  and  $\sigma_2$  (the effect of a price shock in (A) and commodity price shock on income in (B) through the imports and exports channels), and  $\tau'_2$  and  $\tau_2$  (the impacts of a monetary shock in (A) on income in (B) through the exports and imports channels).

### 3 IMPACT OF INTERNATIONAL INCOME, PRICES AND MONETARY SHOCKS ON INCOME IN AFRICAN COUNTRIES THROUGH THE EXTERNAL TRADE CHANNEL: A SVAR MODEL

#### 3.1 Empirical Model Specification

The SVAR model used in this study is inspired by Parnisari (2002). The utilization of VAR models for estimating the models that have real data has been popularized by Diebold (1998) that introduces, in the 80s, the VAR models in economic literature.

Thus, under stationarity condition, it is possible to apply the Wold theorem and present a vector  $y_t$ , like in equation (1) for example, in the form of a Vector Moving Average (VMA). In this context, we suppose that each economy of the sample is estimated using a VAR (p) with the polynomial form:

$$\emptyset(L)y_t = c + \varepsilon_t \quad (5)$$

With  $y_t$  the vector of  $n$  endogeneous variables with  $(n \times 1)$  dimension,  $p$  the number of lags,  $c$  the constant with  $(n \times 1)$  dimension,  $L$  the lags operator ( $L^n y_t = y_{t-n}$ ).  $\emptyset$  is the matrix of lags polynomials ( $\emptyset(L) = I_n - \emptyset_1 L - \emptyset_2 L^2 -$

$\dots - \phi_p L^p$ ) with  $I_n$  an identity matrix with  $(n \times n)$  dimension and  $\phi_1, \dots, \phi_p$  the matrix of coefficients with  $(n \times n)$  dimension.  $\varepsilon_t$  is a vector of innovations with  $(n \times 1)$  dimension,  $E(\varepsilon_t) = 0$ ,  $E(\varepsilon_t \varepsilon_t') = \Omega$ , and  $E(\varepsilon_t \varepsilon_t') = 0$  for all  $t \neq s$ .

According to (5), the variance-covariance matrix of the vector of innovations  $\varepsilon_t$  can contain non-zero values outside of its diagonal. This implies that, even if the dynamic evolution of the variables of  $y_t$  is well estimated by the autoregressive structure of the polynomial  $\phi(L)$ , the residual innovations can be correlated.

The Structural Vector Autoregressive Models (SVAR) were developed for resolving this problem. They transform the correlated innovation series in the vector  $\varepsilon_t$  in a vector of orthogonal (independent) structural shocks  $e_t$ , that can be economically interpreted. We transform  $\varepsilon_t$  into a vector of independent shocks named  $e_t$ , as in Hamilton (1994) and Stier (2001).

Equation (5), by deleting the constant, can be written in VAR (p) Moving Average:

$$y_t = C(L)\varepsilon_t \quad (6)$$

$$\text{With } C(L) = \phi(L)^{-1}$$

The VAR (p) representation, by deleting the constant, of the dynamic structural model associated to equation (5) is:

$$B(L)y_t = e_t \quad (7)$$

With a variance-covariance matrix for  $e_t$  and normalized at  $I_n$ , that is to say  $E(e_t e_t') = I_n$ . The VMA (p) with the structural shocks associated to equation (7) is:

$$y_t = A(L)e_t \quad (8)$$

$$\text{With } A(L) = B(L)^{-1} \text{ where } A_j \text{ is a matrix } (n \times n) \text{ that must be identified.}$$

The elements  $a_{ni}$  measure the effects of the  $i^{\text{th}}$  structural shock contained in  $e_t$  after  $j$  periods on the  $n^{\text{th}}$  variable.

Equalizing equations (6) and (8), we have:

$$A(L)e_t = C(L)\varepsilon_t \quad (9)$$

Thus, we connect the estimated residuals and structural shocks.

Knowing that  $C$  is an identity matrix, after estimating matrix  $A$ , the structural residuals can be deducted from the observed residuals. The transformed model having more parameters to estimate than the VAR of reduced form that is

estimable, we impose restrictions for identifying matrix A, either short or long term restrictions.

It is also important to specify that we use raw data, which raises the question of the use in the VAR of raw (non-stationary) data or deseasonalized time-series data. For the deseasonalized models, we added in equation (5) a vector of deterministic variables ( $D_t$ ) containing the constant, the seasonal variables, a trend, and other intervention variables:

$$y_t = \emptyset(L)y_t + \psi D_t + \varepsilon_t \quad (10)$$

Matrix  $\psi$  has the coefficients associated to the constant, seasonal influences, deterministic trend, etc. Because if  $y_t$  has the variables with seasonal profiles, part of this seasonality will be in  $\varepsilon_t$ , except in the presence of seasonal cointegration between the variables of vector  $y_t$ . In the literature, part of the papers use the deseasonalized variables (Pétursson and Slok, 2001) while some others use the variables with seasonality (Brüggemann, 2001). In the first case, according to Maravall (1994), the deseasonalized series are estimated, and not the observations. In these conditions, the results depend on the value estimated by statistical technics, the confidence interval for example. It is also necessary to use more assumptions like the orthogonality of unobserved components (seasonality, trend...). That is to say that seasonal fluctuations should be independent of all others fluctuations affecting an economic variable, while this is not always the case in the facts. Finally, the smoothing of the auto-correlated functions of raw data by the correction of seasonality is impacted by the method of deseasonalization.

### 3.2 Variables and Data Characteristics

We calculate the elasticities of equations (1), (2) and (3) using an SVAR model, under stationary condition and Wold theorem, in order to calculate the exposure indicators of equation (4) (equations (1), (2) and (3) correspond to equations (10), (11) and (12) below in the empirical representation). Domestic income in (B) used in the theoretical model is approximated by real GDP per capita in each country of the sample, income in (A) (international income) by real OECD GDP per capita, international monetary policy by the FED monetary policy, world price by the harmonized inflation in OECD countries and commodity prices are used in accordance with the specialization of each country. For taking into account the trade and financial partners diversification observed in African countries in

recent years (Hugon, 2012), we control the external shocks by the real GDP per capita of China. Finally, we use domestic controls variables. Thus, the objective is to measure the effect on domestic real GDP of a FED monetary policy shock, real OECD GDP per capita, harmonized inflation in OECD countries and world prices of raw materials exported by each African country of the sample, through the exports and imports channels.

In the case where real GDP per capita (equation (1)) is the dependent variable, the explanatory (interest) variables are export and import flows of goods and services. There are five different controls variables that approximate the vector  $Z$ . First, public expenditures ( $g$ ): taking this variable into account is necessary to see if the countries of the sample should decrease them (or not) in response to the contagion of international shocks, because this debate is unavoidable in periods of crises; secondly, private investment ( $inv$ ); thirdly, education ( $alph$ ): since education data are often unavailable in Africa, we approximate the level of education by the adult literacy rate even if this variable does not exactly measure the quality of education, and does not take into account the pre-primary, primary and secondary education; Fourthly, health ( $life$ ): we approximate this variable by life expectancy at birth, because it is a good indicator to measure the quality of the health system in a country; Fifthly and finally, the consumer prices index ( $inf$ ): household consumption prices index is a good indicator of their purchasing power and of the government's public policies.

Knowing that the order of apparition of the variables in the SVAR is capital for final results, we base our intuition on economic theory to do this. In this context, we have the following classification:

$$Y_t = (x, m, g, inv, alph, life, inf, gdp) \quad (11)$$

We hypothesize in equation (10) that the exports shocks affect imports, public expenditures, investment, education, health, inflation and domestic GDP per capita. Imports shocks affect public expenditures, investment, education, health, inflation and domestic GDP per capita. Public expenditures shocks affect investment, education, health, inflation and domestic GDP per capita. Investment shocks affect education, health, inflation and domestic GDP per capita. Educations shocks affect health, inflation and domestic GDP per capita. Health shocks affect inflation and domestic GDP per capita. Inflation shocks affect GDP per capita.

In the cases where exports and imports are dependent variables (equations (2) and (3)), we have external and domestic shocks. Concerning the explanatory (interest) variables, we have: first, world commodity prices () shocks according to the specialization of exports of each country, because African Countries essentially produce and export natural resources (Madeley, 2003); secondly, international monetary shocks (*fed*): we approximated them by the FED shocks; thirdly, international income shocks (*gdpocde*): we approximate this type of shock by real GDP (OECD, per capita) shocks (Fernandez Puente, 2009); fourthly and finally, international prices shocks (*infocde*): we approximate these shocks by the harmonized inflation in OECD countries shocks (Allegret and Sand-Zantman, 2010).

Always in the cases of exports and imports equations, we have one external control variable and four domestic controls variables: first, an external control variable: real GDP (per capita) of China (*gdpch*); secondly, private credit to non-financial agents in percentage of real GDP provided to domestic banks (*cred*): it measures the capacity of the banking system in each country to finance domestic economic activity; thirdly, the service value added (*serv*), to take into account the importance of the service sector; fourthly, the industrial value added (*ind*), to take into account the importance of the industrial sector; fifthly and finally, the agricultural value added (*agr*): household consumption in the countries of the sample is essentially composed by imports of foods. Taking into account the agricultural sector is necessary to control whether the specific development of this sector reduces the level of exposure.

In order of appearance in the SVAR, we have:

$$X_t = (p_{rm}, fed, gdpocde, infocde, gdpch, cred, serv, ind, agr, x) \quad (12)$$

$$M_t = (p_{rm}, fed, gdpocde, infocde, gdpch, cred, serv, ind, agr, m) \quad (13)$$

In equations (11) and (12), we hypothesize that world commodity prices influence the monetary policy of the FED, GDP (OCDE, per capita), harmonized inflation in OCDE countries, GDP per capita of China, domestic control variables and external trade (exports in equation (11), imports in equation (12)). The monetary policy of the FED influences GDP (OCDE, per capita), harmonized inflation in OCDE countries, GDP per capita of China, domestic control variables and external trade. GDP (OCDE, per capita) influences harmonized inflation in OCDE countries, GDP per capita of China, domestic control variables and external

trade. Harmonized inflation in OCDE countries influences GDP per capita of China, domestic control variables and external trade. GDP per capita of China influences domestic control variables and external trade. The domestic control variables influence external trade.

All macroeconomic data are expressed in U.S. dollars and come from the World Bank ("African Development indicators") and OECD ("StatExtracts") on-line databases. For commodity prices, the data also come from the World Bank ("World Bank Commodity Price Data"). They are supplemented by data from USGS (U.S. Geological Survey) and Tradetech (for the prices of uranium). All variables are in logarithm for the interpretation in terms of elasticities. ADF and Phillips-Perron tests are used to study the stationarity of the series, in accordance with the assumption of the empirical specification (stationary condition, for using the Wold theorem). We remove the aberrant values of the variables and replace them by the values obtained using linear interpolation. We also use this method to calculate missing values. In applying the models, the Akaike Information Criterion (AIC) is used to determine the optimal lag length. After the estimations, the residual autocorrelation test (LM test) and collinearity test (Wald test) are performed, and the stability of the models is also checked. The models are individually estimated in 16 African countries between 1970 and 2012. We choose individual tests because the countries of the sample are exposed to external common and individual shocks according to the specialization of their exports. Our model is based on the fluctuations of activity and demand shocks that are short term phenomena. In fact, Blanchard and Quah (1989) use short term restrictions for demand shocks and long term restrictions for production shocks. Thus, we use short term SVAR and Cholesky decomposition (Sims, 1980). In this context, we impose exclusion restrictions on the variables that are not significant in matrix  $A$  in order to achieve identification. For the estimated matrix  $A$  and  $B$  we retain only the coefficients that are necessary to answer the question studied in this paper. In other words, after estimating matrices  $A$  and  $B$  of domestic GDP per capita for example (equation (10)), we retain only the independent variation of domestic GDP (in matrix  $B$ ) and estimated residuals shocks (in matrix  $A$ ) that significantly impact this variable in the estimated empirical equation for economic interpretation. The impulse response functions after the external shocks, according to the significativity of the estimated coefficients, are also reported.

### 3.3 Results

In this subsection, we present the results, that is to say the tables and figures representing first the real GDP per capita equation; secondly the exports and imports equations, and finally the exposure of the countries of the sample according to the type of external shocks and transmission channels. The variables are in logarithm for the interpretation in terms of elasticities.

#### 3.3.1 Elasticities of Real GDP per Capita Equation

Table 1 presents the origin of the impulsions of domestic GDP. In the short term, domestic GDP is caused by its own fluctuations in all countries, but on a small scale, with the exceptions of Malawi and Zambia with respectively 0.12 and 0.101%. Fluctuations are caused by exports in twelve countries and imports in nine countries, which is a first interesting result since the imports channel is nearly as often significant as the exports channel. Exports have a positive influence on GDP, at least 0.161% in Niger and at most 0.687% in Zambia. The response of domestic income after an export shock is significant and positive the first year. The effect decreases the second year and in general disappears after three years (see graphs 1). Concerning imports, they have positive effects in ten countries and a negative effect in one country (Zambia). This result is in accordance with the empirical literature for which import flows have a positive effect on GDP in Developing Countries if imports are composed of investment goods and ameliorate social well-being through household consumption ((Ugur, 2008; Cetintas and Barisik, 2009). Conversely, imports have a negative effect if they negatively impact domestic production, discourage domestic investment and lead to imported inflation (Fernandez Puente et al. 2009; Ullah et al. 2009). The response of GDP after an import shock is significant and positive (with the exception of Zambia) the first year, but contrary to the reaction after an export shock, the effect disappears after four years at least and seven years at most (Tunisia) (see graphs 2). These results imply that income in African countries is more durably impacted by imports than exports shock...

*Table 1* Origins of the impulsions of domestic GDP per capita

Algeria	Benin	Botswana	Cameroon	C. Af. Rep.	Chad	Kenya	Malawi
0.027	0.038	0.033	0.029	0.066	0.077	0.03	0.12
(8.25)	(8.49)	(8.37)	(8.49)	(8)	(8.37)	(8.37)	(8.37)
0.343	--	0.275	--	--	0.229	0.25	0.518

<b>Algeria</b>	<b>Benin</b>	<b>Botswana</b>	<b>Cameroon</b>	<b>C. Af. Rep.</b>	<b>Chad</b>	<b>Kenya</b>	<b>Malawi</b>
(11.85)		(3.37)			(3.8)	(2.62)	(3.04)
--	0.394	0.2967	0.166	0.61	--	0.168	--
	(3.77)	(2.66)	(1.96)	(6.3)		(2.24)	
0.437	--	0.123	0.437	0.164	-0.091	--	0.347
(5.08)		(1.67)	(9.73)	(2.76)	(-0.091)		(1.88)
0.279	0.079	0.15	0.218	--	0.27	0.971	0.277
(3.27)	(1.79)	(1.66)	(4.78)		(4.94)	(14.84)	(1.68)
--	0.086	--	--	--	--	--	--
	(1.93)						
2.306	-2.531	--	--	-4.434	7.813	-1.264	--
(2.79)	(-2.54)			(2.9)	(4.1)	(-2.15)	
--	--	--	0.635	2.858	-7.258	--	--
			(2.81)	(2.1)	(-1.94)		
<b>Mali</b>	<b>Niger</b>	<b>Nigeria</b>	<b>Senegal</b>	<b>S. Africa</b>	<b>Togo</b>	<b>Tunisia</b>	<b>Zambia</b>
0.048	0.036	0.07	0.033	0.078	0.046	0.022	0.101
(8.48)	(8.49)	(8.37)	(8.49)	(8.37)	(8.37)	(8.37)	(8.37)
--	0.161	0.413	0.264	0.363	0.469	0.372	0.687
	(2.71)	(10.78)	(3.98)	(1.76)	(8.21)	(8)	(7.04)
0.268	0.151	--	--	--	--	0.16	-0.882
(2.11)	(6.4)					(2.5)	(-3.61)
0.667	0.353	--	0.477	0.577	0.161	0.536	--
(7.68)	(6.21)		(7.14)	(3.48)	(2.42)	(7.67)	
--	--	1.252	0.327	--	--	0.274	--
		(3.97)	(3.96)			(-1.9)	
--	-0.004	--	--	--	0.004	-0.056	-0.02
	(-5.03)				(-2.8)	(-6.43)	(-2.27)
--	--	5.827	3.706	5.036	7.33	1.764	--
		(3.73)	(5.03)	(2.91)	(4.59)	(2.27)	
-1.258	0.448	--	--	52.391	--	2.363	-21.452
(-4.87)	(1.79)			(2.92)		(2.22)	(1.64)

Model: SVAR. Dependant variable: Number of observations (by country): T = 43 (1970-2012). t statistics in parentheses.

Coefficients with a significant (significantly different from 0) value at the 10% level at least

Concerning control variables, public expenditures impact GDP in eleven countries, with nearly always a positive effect (in ten countries). This result is particularly important, since it implies that African countries should not decrease public expenditures because they promote GDP per capita and enhance resistance to the contagion of external shocks in periods of crises. Moreover, the effect of domestic

investment is positive and significant on GDP per capita in ten countries. Human capital variables are less often significant, but have most of time a positive effect. Education affects GDP positively in five countries, and negatively in three countries (in Chad, Mali and Zambia, suggesting that the educative system is not adapted to domestic economic needs). The Health system positively impact GDP in seven countries and negatively in only two countries (Central African Republic and Kenya). Finally domestic inflation has a negative effect on GDP in four countries and a positive effect in only one country (Benin), which means that even if inflation targeting is nearly never counterproductive, the effet on domestic growth is seldom significant.

Finally, in this early stage, the results show that three quarters of the countries of the sample are affected by exports and more than a half by imports shocks, nearly always with a positive correlation with growth in both cases, and that the persistence of an imports shock is notably longer than an exports shock. Fiscal policies, particularly (*via* domestic investments, health and education expenses), can mitigate the effect of international shocks while monetary policy (*via* domestic prices stability) seems to have a weak effect.

### 3.3.2 Elasticities of Exports Equation

*Table 2* Origins of the impulsions of exports

<i>Algeria</i>	<i>Benin</i>	<i>Botswana</i>	<i>Cameroon</i>	<i>C. Af. Rep.</i>	<i>Chad</i>	<i>Kenya</i>	<i>Malawi</i>
0.11 (8.25)	0.113 (8.37)	0.074 (8.37)	0.05 (8.12)	0.093 (8.37)	0.23 (8.37)	0.062 (8.37)	0.077 (8.37)
-1.326 (-2.35)	1.577 (3.41)	1.356 (4.5)	--	0.787 (1.77)	3.056 (3.21)	1.147 (4.93)	0.75 (2.49)
0.539 (4.64)	--	--	-0.315 (-3.68)	0.182 (1.62)	-0.432 (-1.84)	--	--
-0.549 (-4.66)	--	-0.003 (-2,34)	0.865 (6.64)	-0.413 (-2.77)	-0.523 (-2.35)	-0.515 (-2.19)	-0.422 (-4.59)
0.664 (1.96)	--	--	-0.597 (-3.51)	--	--	--	--
-0.313 (-2.46)	--	--	--	--	--	0.564 (2.11)	--
--	--	--	0.437 (5.16)	0.493 (4.6)	0.391 (2.05)	--	0.43 (2.93)
--	0.61 (2.36)	--	--	--	1.183 (1.83)	--	--
--	--	--	-0.032 (-3.48)	0.023 (1.93)	--	--	-0.081 (-1.68)
--	--	0.18 (2.51)	0.425 (4.87)	--	--	--	--

	<i>Algeria</i>	<i>Benin</i>	<i>Botswana</i>	<i>Cameroon</i>	<i>C. Af. Rep.</i>	<i>Chad</i>	<i>Kenya</i>	<i>Malawi</i>
<i>Other raw materials</i>	0.362 (-1.65)		0.136 (1.99)	0.434 (3.22)	0.134 (2.07)		0.266 (5.52)	0.479 (3.71)
							0.237 (2.7)	
	<i>Mali</i>	<i>Niger</i>	<i>Nigeria</i>	<i>Senegal</i>	<i>S. Africa</i>	<i>Togo</i>	<i>Tunisia</i>	<i>Zambia</i>
	--	0.117 (8.37)	0.099 (8.37)	0.059 (8.37)	0.83 (8.37)	0.145 (8.37)	0.055 (8.12)	0.105 (8.12)
	0.119 (8.37)	3.814 (6.71)	1.136 (2.83)	1.965 (7.34)	--	1.731 (2.58)	0.607 (2.4)	-1.863 (-3.55)
	0.238 (2.24)	-0.247 (-1.87)	0.16 (1.61)	--	--	--	--	0.589 (5.14)
	--	--	-0.172 (-2.77)	-0.404 (-2.19)	0.696 (-2.15)	--	--	-0.619 (-5.57)
	0.231 (1.66)	-0.746 (-1.92)	--	-1.611 (-3.69)	--	--	1.09 (4.51)	0.277 (1.66)
	--	--	--	0.469 (4.75)	--	--	--	--
	--	--	0.788 (8.04)	--	-0.642 (-2.42)	--	-1.287 (-4.75)	--
	--	--	--	0.283 (1.96)	0.372 (1.76)	-0.727 (-2.45)	--	--
	--	--	--	--	0.081 (1.67)	--	-0.017 (-1.93)	--
	--	--	0.341 (2.58)	0.267 (4.2)	--	--	--	--
<i>Other raw materials</i>		-0.606 (-2.02)		0.435 (5.05)			0.311 (2.54)	0.374 (4.31)
		0.26 (2.26)		0.279 (3.89)			-0.455 (-2.95)	0.359 (1.66)

Model: SVAR. Dependent variable:.. Number of observations (by country): T = 43 (1970-2012). t statistics in parentheses.

Coefficients with a significant (significantly different from 0) value at the 10% level at least.

Six countries in the sample are oil producers and one country exports transformed oil products (Senegal). The world price of oil positively affects exports in four countries: Botswana, Cameroon, Nigeria and Senegal. At least one world price of a raw material exported by each country of the sample has a significant influence on its exports, which is the main result concerning the exports dynamics. In some countries, where the sign is negative, it implies that the decrease in demand resulting from the increase of prices (“volume effect”) is higher than the increase in the value of the exports (“prices effect”). This is the case in Algeria and Tunisia (prices of Natural Gas), and Niger (Index of agricultural products).

Concerning international income and prices shocks, real OECD GDP per capita is the most significant variable. It explains the fluctuations of exports in

twelve countries (positively in ten). The reaction of exports is significant and positive the first year, decreases the second year and in general disappears after five years (see graphs 4), in conformity with Berman and Martin (2012).. The harmonized inflation in OECD countries and FED monetary policy have weaker effects: they influence exports in respectively eight countries (with a negative impact in three countries); and five countries.

Concerning control variables, two main results are noticeable. First, the external control variable (real GDP per capita of China) influences exports in six countries of the sample. Secondly, as regards domestic control variables, domestic credit in percentage of GDP has a significant effect on exports in eleven countries, but this effect is negative in ten countries, which implies that the banking sector in the countries of the sample does not finance firms that are exports-oriented.

### **3.3.3 Elasticities of Imports Equation**

Concerning the imports equation, we measured the exposure of imports to world prices of oil in all the countries of the sample and other commodity prices according to the production of each country. We observe that commodity prices (including oil prices in ten countries) positively affect imports, in conformity with the empirical literature (see Nkomo, 2006 for example). The reaction of imports after an oil price shock is positive the first year and the effect disappears after five years (see graphs 9). This results from the fact that imports prices become higher after a positive oil price shock.

The other most significant, like in the case of exports, is real OECD GDP per capita, which positively affects imports in ten countries. OECD harmonized inflation is significant in nine countries. The reaction of imports after a positive income shock in OECD countries is significant and positive the first year. The effect in general disappears after five years (see graphs 7). Thus, an increase of income in OECD countries increases demand, and therefore the prices of the products sold in OECD countries and exported by African countries.

The FED monetary policy influences imports in five countries. The external control variable (GDP per capita of China) has a significant effect on imports in six countries. Domestic control variables are all often significant: credit in seven countries, services in eight countries, industry in six countries and agriculture value added in eight countries.

**Table 3:** Origins of the impulsions of imports

	<b>Algeria</b>	<b>Benin</b>	<b>Botswana</b>	<b>Cameroon</b>	<b>C. Af. Rep.</b>	<b>Chad</b>	<b>Kenya</b>	<b>Malawi</b>
	0.095 (8.25)	0.094 (8.37)	0.079 (8.37)	0.051 (8.12)	0.098 (8.37)	0.189 (8.37)	0.039 (8.37)	0.107 (8.37)
	--	--	0.16 (5.02)	--	0.948 (1.84)	2.217 (2.82)	0.678 (3.6)	--
	-0.21 (-1.77)	--	0.219 (3.06)	-0.134 (-2.17)	--	--	0.169 (3.15)	-0.229 (-1.7)
	--	--	-0.002 (-1.74)	-0.271 (-2.42)	-0.421 (-2.39)	--	1.463 (5.94)	--
	-0.699 (-1.76)	--	-1.076 (-2.81)	--	--	--	--	-0.368 (-2.78)
	--	--	--	--	0.294 (1.88)S	--	0.835 (4.54)	--
	-0.555 (-3.65)	--	--	--	--	0.507 (3.6)	-0.518 (-3.85)	--
	--	--	--	-0.377 (-2.85)	--	1.045 (2.15)	-0.551 (-5.17)	-0.754 (-2.8)
	-0.053 (-4.11)	-0.277 (-3.87)	--	--	--	--	0.111 (2.99)	--
	-0.512 (-3.33)	0.236 (2.02)	--	0.23 (3.61)	--	--	0.069 (1.64)	0.255 (2.4)
<i>Other raw materials</i>	0.276 (1.69)	0.236 (1.96)	--	--	0.358 (2.86)	--	0.91 (2.17)	0.623 (2.67)
	--	--	--	--	--	--	--	-0.283 (-2.3)
	<b>Mali</b>	<b>Niger</b>	<b>Nigeria</b>	<b>Senegal</b>	<b>S. Africa</b>	<b>Togo</b>	<b>Tunisia</b>	<b>Zambia</b>
	0.083 (8.37)	0.239 (8.37)	0.122 (8.37)	0.425 (8.37)	0.085 (8.37)	0.106 (8.37)	0.047 (8.12)	0.041 (8.12)
	1.245 (3.39)	2.613 (2.45)	--	--	--	1.369 (2.74)	--	0.428 (1.88)
	0.145 (1.66)	-0.596 (-2.3)	--	--	--	--	0.208 (3.6)	0.2 (4.23)
	0.214 (-2.07)	--	--	--	--	0.339 (2.72)	0.352 (1.78)	--
	0.241 (1.75)	--	0.452 (2.57)	--	-1.036 (-2.13)	--	0.872 (4.2)	--
	--	--	0.415 (2.52)	2.199 (1.99)	--	0.207 (1.74)	-0.29 (3.1)	-0.14 (-2.79)
	--	--	0.633 (4.7)	-2.342 (-1.69)	--	--	-0.375 (-2.08)	--
	--	--	-1.194 (-3.8)	--	0.833 (6.41)	--	--	--
	--	--	0.03 (2.2)	--	0.085 (1.83)	--	--	--
	0.143 (1.67)	--	0.379 (-2.41)	0.257 (4.05)	--	0.207 (2.22)	0.182 (2.64)	--
<i>Other raw materials</i>	--	--	--	0.269 (2.89)	--	--	-0.635 (-5.63)	0.157 (4.28)
	--	--	--	0.335 (3.65)	--	--	--	0.391 (7.45)

Model: SVAR. Dependant variable: Number of observations (by country): T = 43 (1970-2012). t statistics in parentheses.

Coefficients with a significant (significantly different from 0) value at the 10% level at least.

### 3.3.4 Exposure to External Shocks by the Exports and Imports Channels

Based on the multiplication of elasticities according to the index of expositions in equation (4), table 4 presents the exposure of the countries of the sample to international shocks through exports and imports channels. In order to ensure comparability, we represent common shocks only. The exposure of exports to oil shocks is taken into account only in the countries that export this product, and the exposure of imports to this variable is measured in all the countries).

*Table 4* Exposure of income through the exports and imports channels

	<i>Channel</i>	<i>Algeria</i>	<i>Benin</i>	<i>Botswana</i>	<i>Cameroon</i>	<i>C. Af. Rep.</i>	<i>Chad</i>	<i>Kenya</i>	<i>Mali</i>
<i>FED</i>	x m	--	-0.089	--	--	--	--	0.019	--
<i>GDP/h</i>	x	-0.455		0.373			0.7	0.037	
<i>OECD</i>	m		0.63	0.047	--	0.578		0.114	0.334
<i>Inf.</i>	x	0.185					-0.099		
<i>OECD</i>	m		--	0.065	-0.022	--		0.028	0.039
<i>Oil</i>	x m	--	0.093	0.05	0.038	--	--	0.012	0.038
	<i>Channel</i>	<i>Malawi</i>	<i>Niger</i>	<i>Nigeria</i>	<i>Senegal</i>	<i>S. Africa</i>	<i>Togo</i>	<i>Tunisia</i>	<i>Zambia</i>
<i>FED</i>	x m	-0.045	--	--	--	0.029	--	-0.006	--
<i>GDP/h</i>	x	0.389	0.614	0.469	0.519	--	0.812	0.226	-1.28
<i>OECD</i>	m								-0.377
<i>Inf.</i>	x		-0.04	0.066					0.405
<i>OECD</i>	m	--	-0.09		--	--		0.033	-0.176
<i>Oil</i>	x m	--	--	0.141	0.07	--	--	0.029	--

Thus, we observe that all the countries of the sample are at least exposed to one type of international shock. Thirteen countries are exposed to real GDP per capita shocks. Among them, seven countries are exposed only by the exports channel, three countries only by the imports channel and three by both. Ten countries are exposed to harmonized inflation in OECD countries. Among them, three countries are exposed only by the exports channel, five only by the imports channel, and two by both. Of seven countries that export oil products, three are exposed to world prices of oil through the exports channel. Five countries are exposed to this variable through the imports channel. Only four countries of the sample are exposed to the FED monetary policy through the export and import channels.

#### 4. CONCLUSION

Our results emphasize that African Countries are actually exposed to international monetary, income and prices shocks through external trade channels. The intensity of the impacts depends on their specializations and public policies. African Countries essentially export raw materials and import finished products for household consumption. In this context, a decrease in income in advanced countries leads to a reduction of household consumption in these countries and therefore a decrease in the revenue and production of firms. The resulting reduction of the demand of raw materials by firms negatively impacts income in African Countries through the exports channel (and conversely for an increase of the demand in period of good conjuncture in advanced countries). Fluctuations in prices affect the value of exports of raw materials and lead to imported inflation through the imports channel, therefore impacting domestic purchasing power.

Moreover, the results that i) African economies are exposed above all through international income rather than international prices shocks and ii) the imports channel is nearly as often significant as the exports channel suggest that their exposure results from their positioning at the low end of the value chain (including financial sectors, which do not finance exports-oriented firms), rather than just the concentration of exports on several raw materials. This has large policy implications, and first among them the need to promote activities that allow to move up the value chain. The current discussion on this matter, notably within international institutions, focuses on regional value chains. Though developing countries of the same regions partly have the same comparative and competitive advantages, regional value chains offer the opportunity to capitalize on existing local value chains length.

As for results concerning domestic (essentially public policy) variables in the income equations, they suggest that there is still a rationale for public policies sustaining growth in developing countries, which is not a minor concern after a large global crisis that has generated a massive return of fiscal policy stimulus in advanced economies. The developing countries which are impacted by external negative shocks can use public policies to sustain economic growth. Public policies of education, health and public infrastructure, through public spending, are the interesting factors. Life expectancy at birth and education actually positively explain national income. In periods of contagion, a population in good health and

better educated can, for example, create the new business models and activities to withstand the crisis. Likewise, in order to support domestic household consumption, it is desirable to produce locally as much goods and services as possible in order to reduce imported inflation; and to redistribute the revenues arising from the exploitation of raw materials. Finally, African developing countries should increase investment in human and physical capital in particular and public expenditure in general, with a particular emphasis on moving up the value chain, so as to reduce international crises impact.

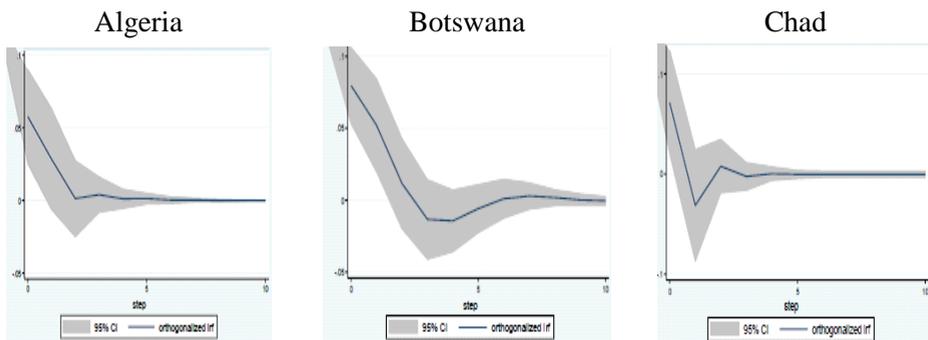
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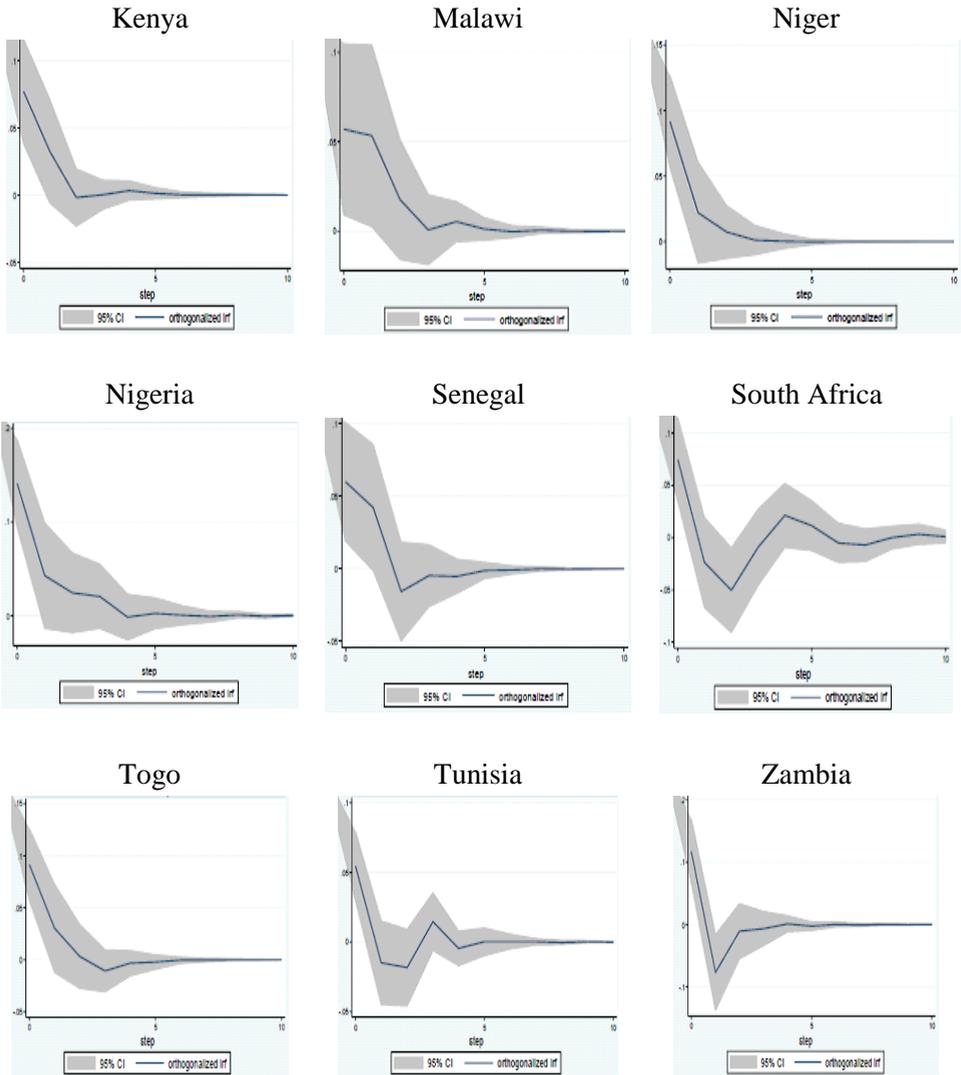
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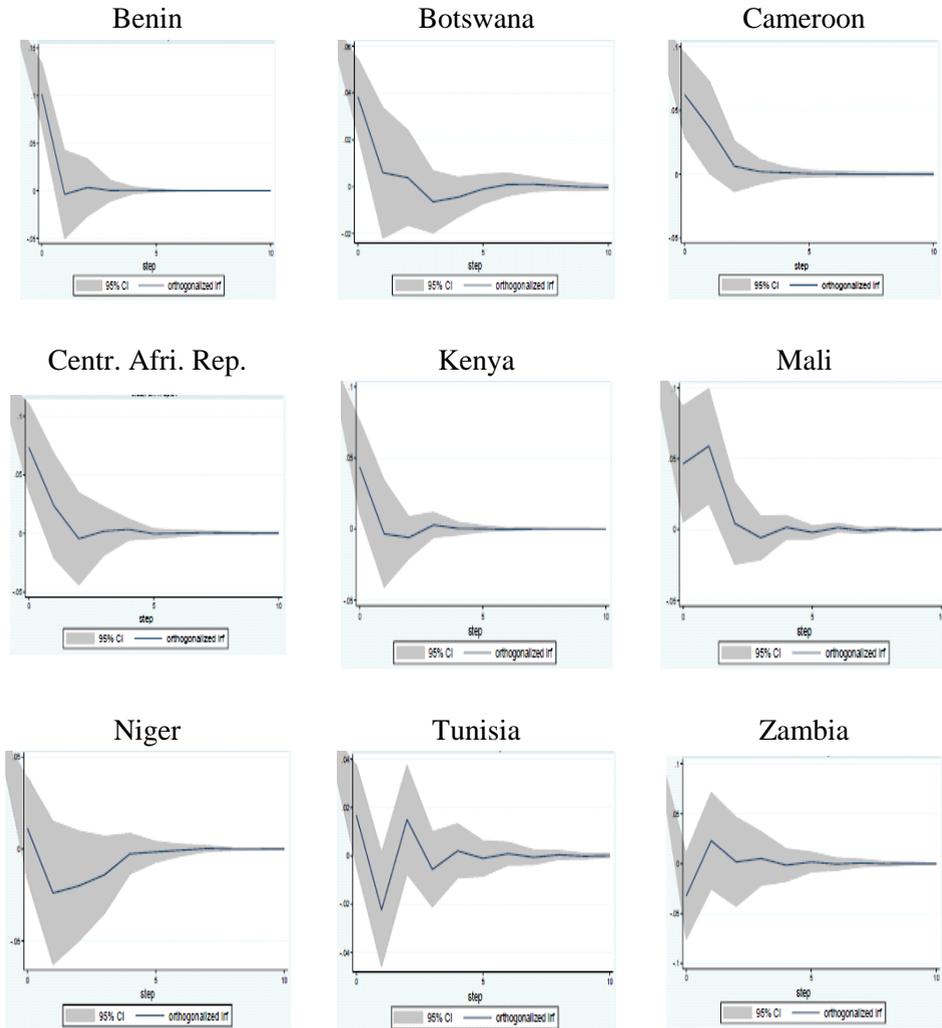
### Annex I: Impulse response functions after common external shocks

Graphs 1: impulse variable (x) response variable (gdp)

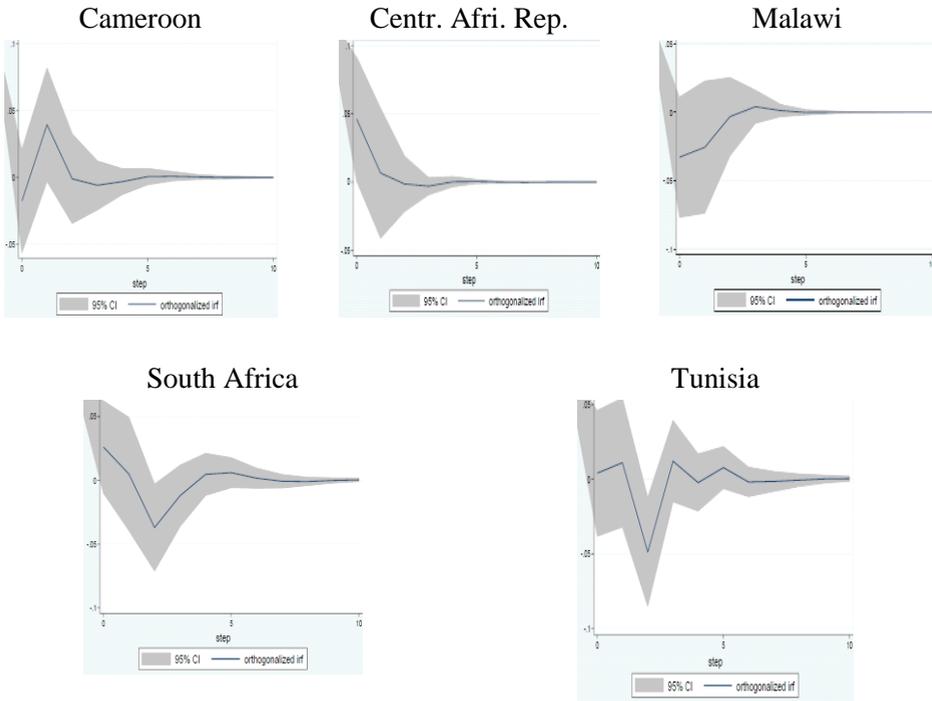




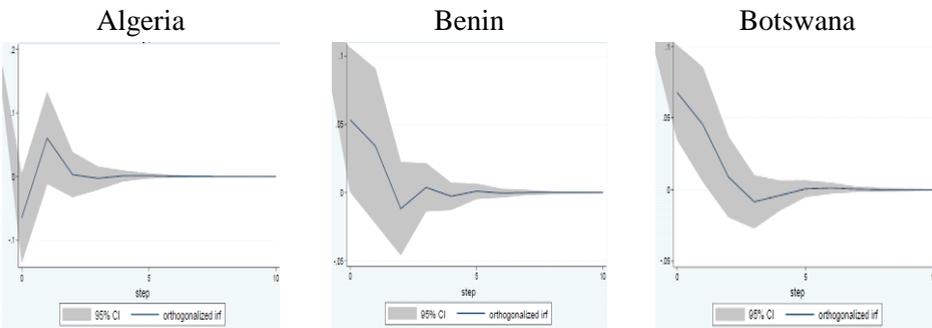
Graphs 2: impulse variable (m) response variable (gdp)

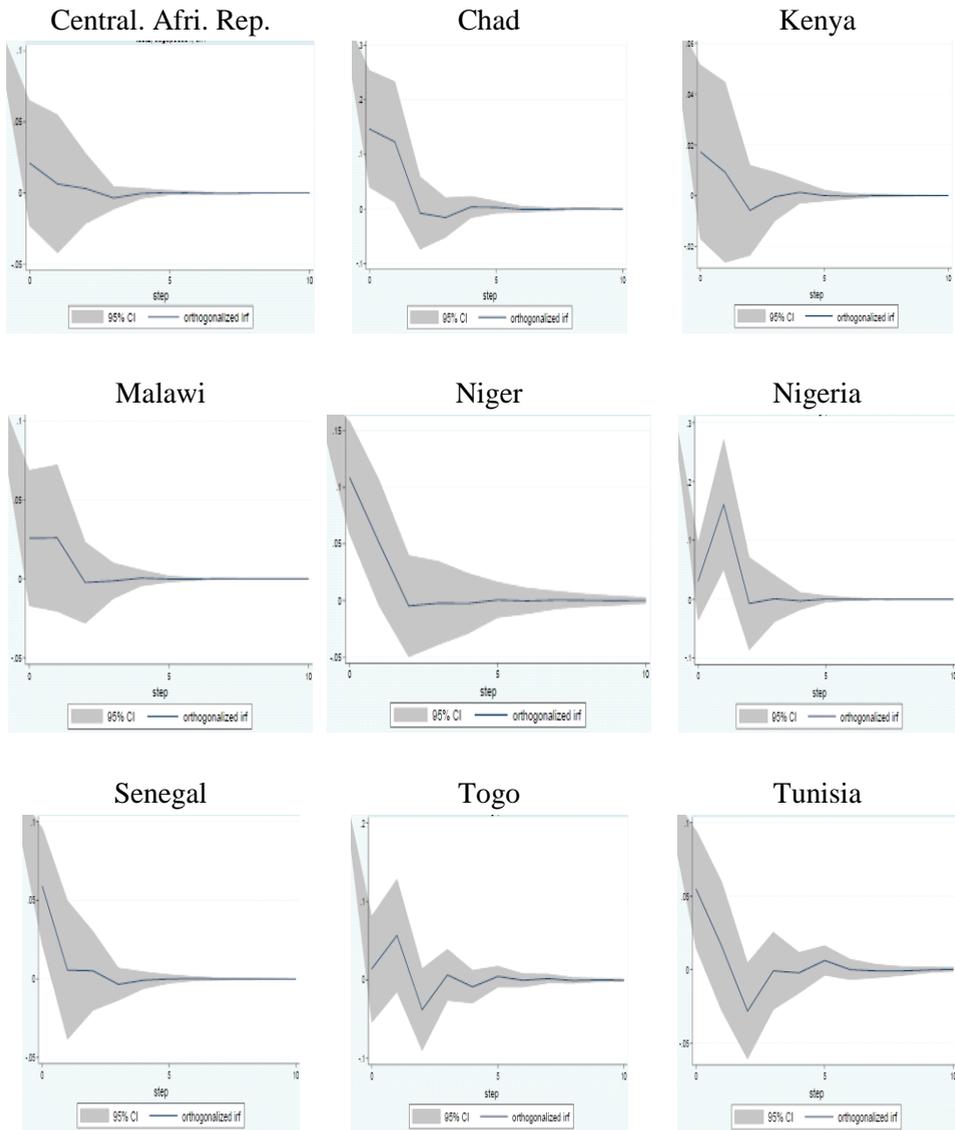


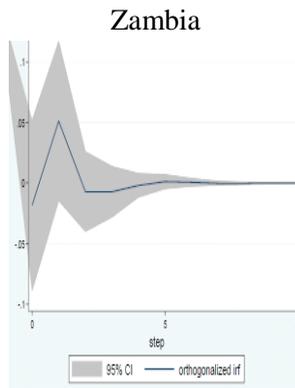
Graphs 3: impulse variable (fed) response variable (x)



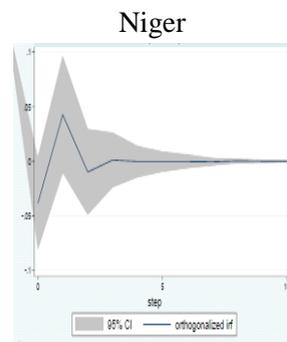
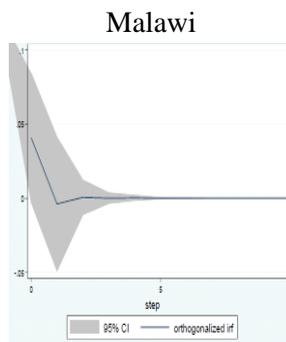
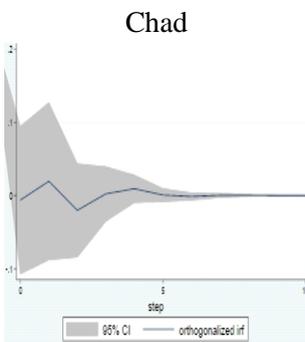
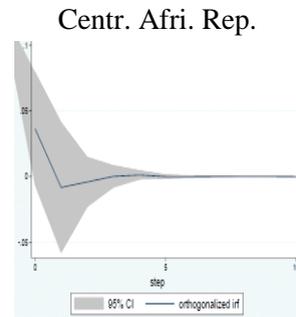
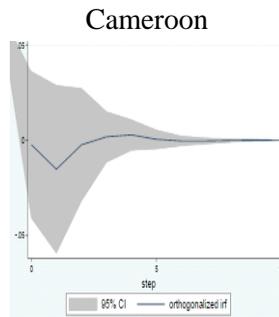
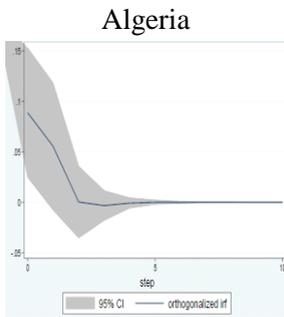
Graphs 4: impulse variable (gdpcde) response variable (x)

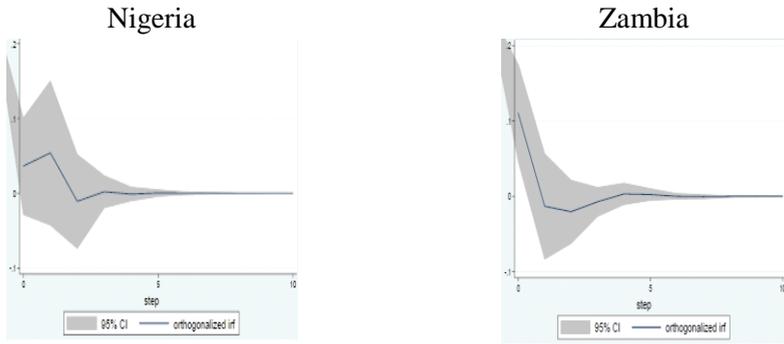




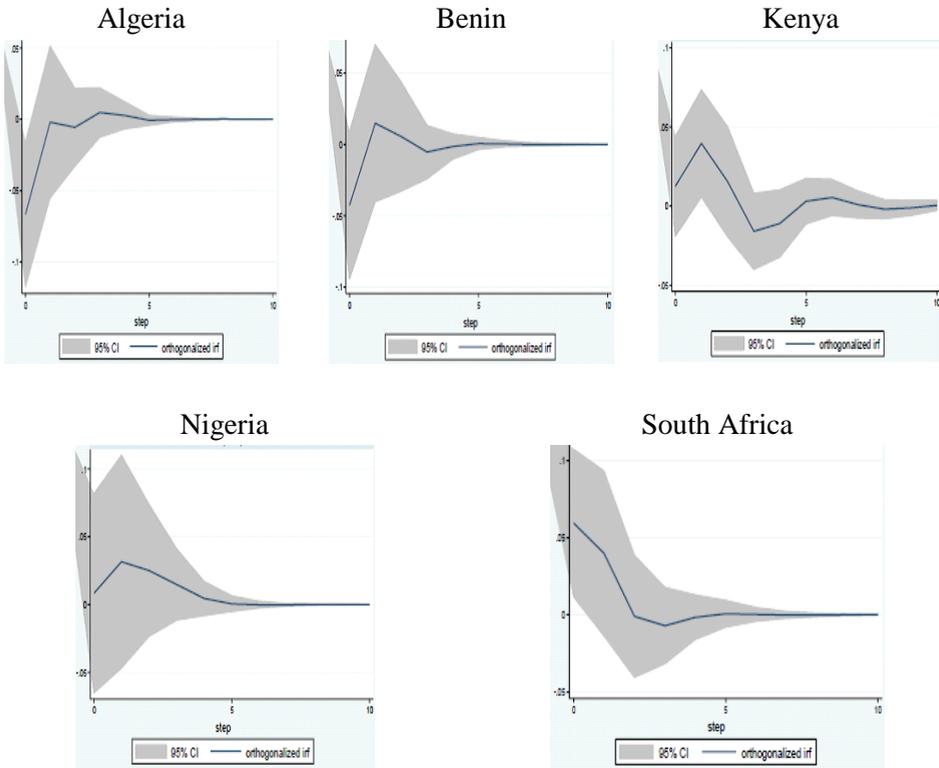


Graphs 5: impulse variable (infocde) response variable (x)

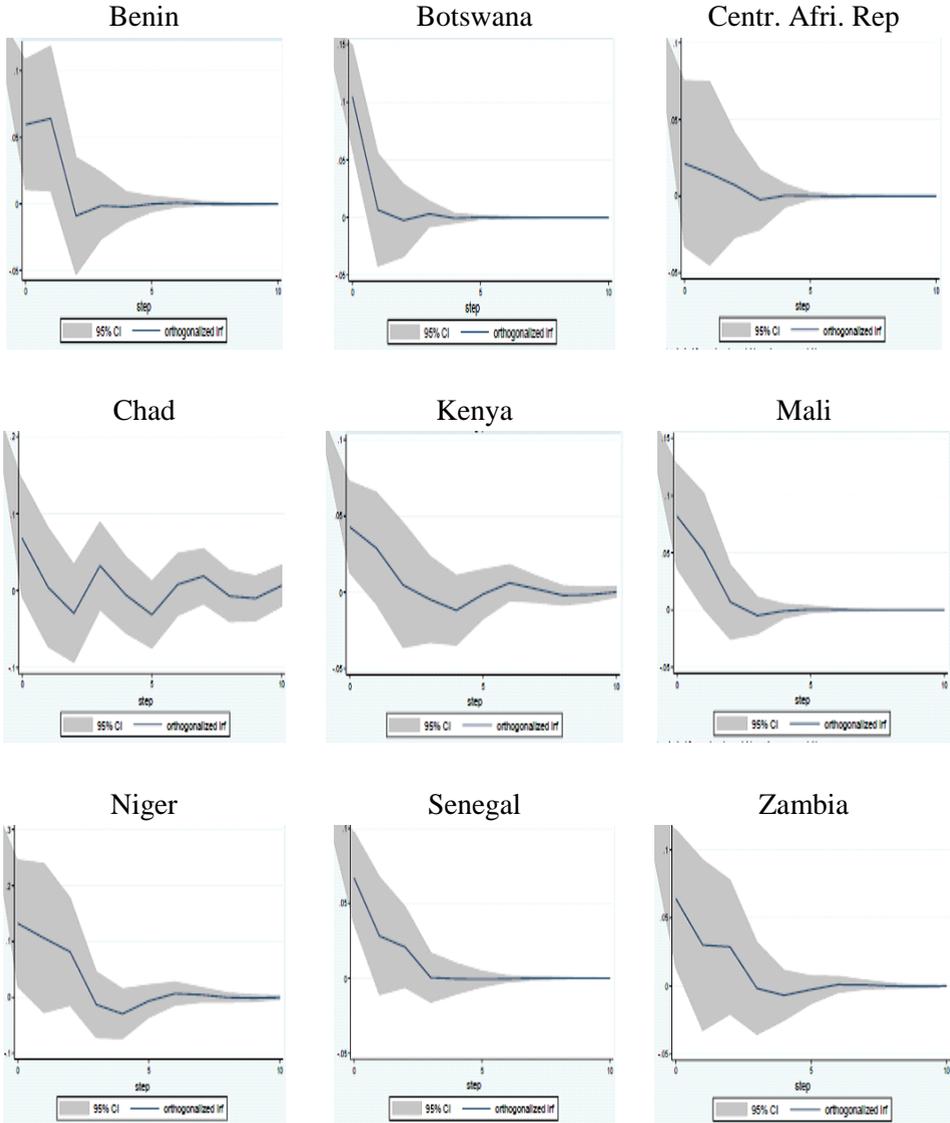


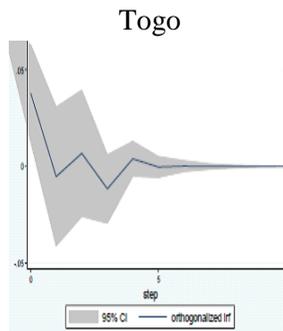


Graphs 6: impulse variable (fed) response variable (m)

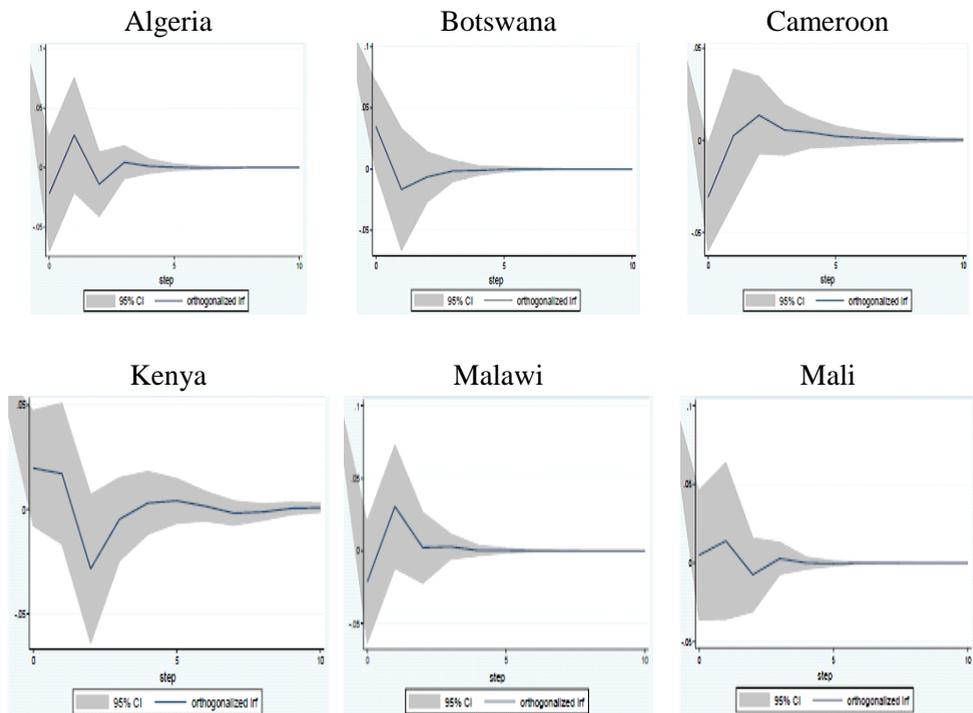


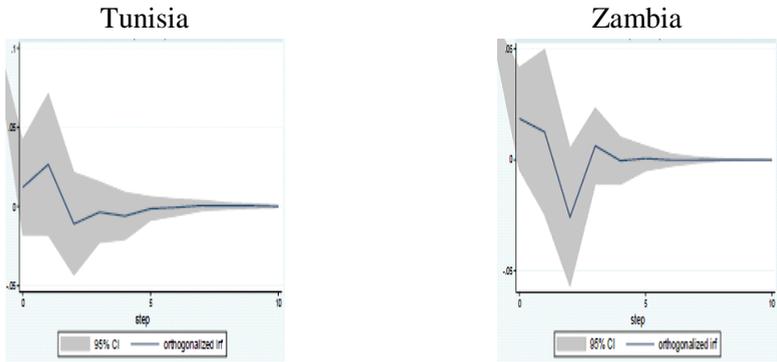
Graphs 7: impulse variable (gdpcde) response variable (m)



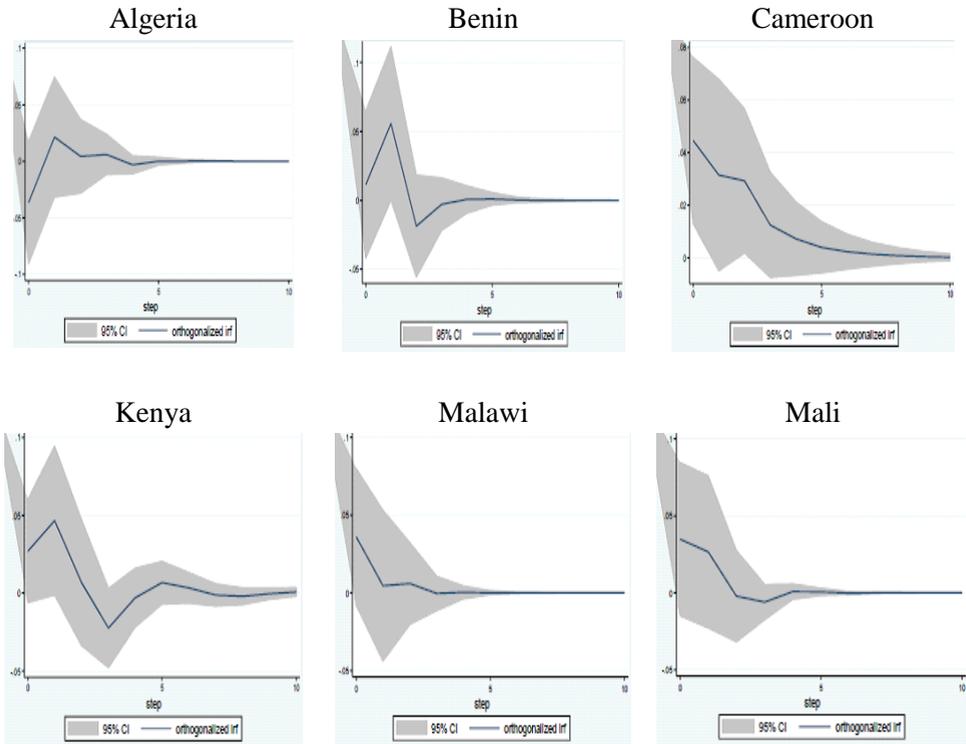


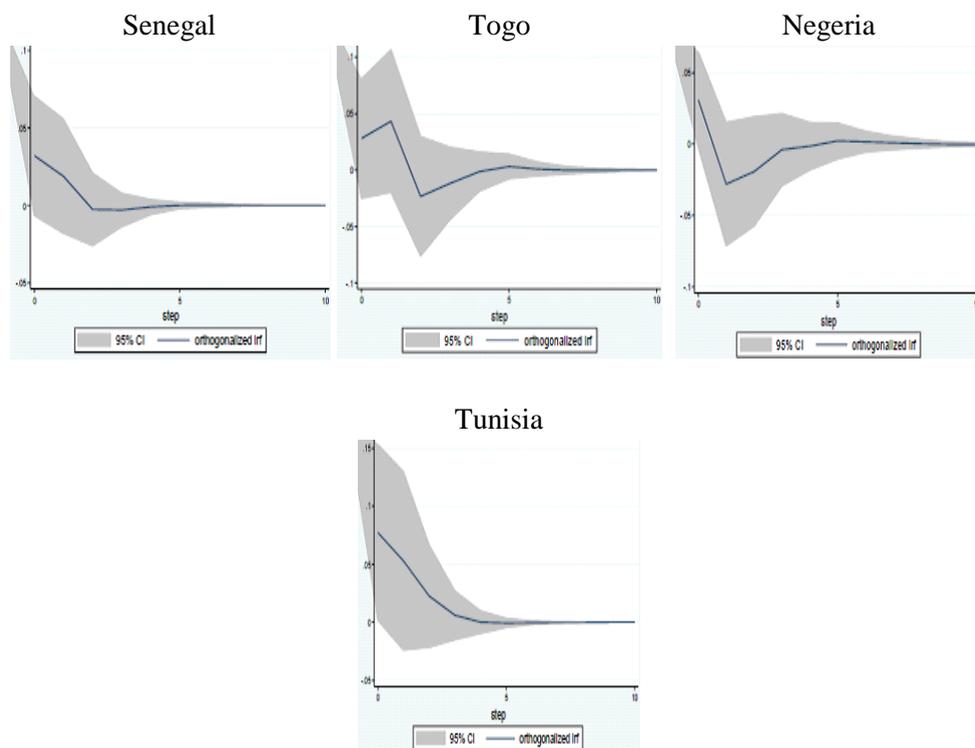
Graphs 8: impulse variable (infocde) response variable (m)





Graphs 9: impulse variable (oil) response variable (m)





**Annex 2:** Exported raw materials and specialization of the countries of the sample

	<b>Oil producer</b>	<b>Other Specializations</b>	<b>Tested indexes</b>	<b>Source of data</b>
Algeria	Yes	Natural Gas	Natural Gas Index Oil	WB
Benin	Yes	Cotton(40% of the exports)	Oil Cotton, A index***	WB
Botswana	Yes	Diamond (60% of the exports) Copper Uranium Coal	Oil Diamonds Gemstones Uranium index U308	USGS / WB IMF Tradetech**** WB
Cameroon	Yes (40% of the exports)	Agriculture Timber Metals	Oil Agricultural index Timber	WB WB WB
Central African Rep.		Diamond Gold Uranium	Diamonds Gemstones Gold Uranium index U308	/ USGS WB IMF / Tradetech
Chad	Yes		Oil	

	<b>Oil producer</b>	<b>Other Specializations</b>	<b>Tested indexes</b>	<b>Source of data</b>
Kenya		Maize	Maize	WB
		Tea	Tea, average	WB
		Coffee	Coffee, Arabica	WB
Malawi		Agriculture		WB
		Uranium	Agricultural index	IMF / Tradetech
		Coal	Aluminum	WB
Mali		Bauxite		WB
		Gold (8% of GDP)	Gold	WB
Niger		Uranium (5% of GDP)	Uranium index U308	IMF / Tradetech
		Agriculture (30% of GDP)	Agricultural index	WB
Nigeria	Yes (90% of the exports)		Oil	
Senegal		Refined petroleum products	Oil	WB
		Phosphate	Phosphate rock	WB
		Fish meal	Fish meal	WB
		Honey	Honey	WB
South Africa		Gold		WB
		Platinum	Gold	WB
		Coal		WB
		Chrome		USGS
Togo		Phosphate (4 <sup>th</sup> world product)	Phosphate rock	WB
Tunisia		Natural Gas	Natural Gas Index	WB
		Phosphate	Phosphate rock	WB
		Agriculture	Agricultural index	WB
Zambia		Copper (7 <sup>th</sup> world product)		WB
		Cobalt (2 <sup>th</sup> world product)		USGS
		Uranium	Copper	IMF / Tradetech
		Iron	Cobalt	WB
		Coal		WB
		Gold		WB
		Diamond		USGS

**MONETARY, BANKING AND FINANCIAL ISSUES IN  
CENTRAL AND EASTERN EU MEMBER COUNTRIES**

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# RETAIL PAYMENT AND ECONOMIC GROWTH FOR DEVELOPED AND EMERGING EUROPEAN COUNTRIES

Aniela BOJAN\*, Emilia-Anuta COROVEI\*\*, Ioan TRENCA\*\*\*

**Abstract:** *The purpose of this article is to identify the retail payment instruments that influence the economic growth. The present paper contributes to the strand of literature by showing the impact of payment market infrastructure from this new perspective. For this purpose we developed a panel framework consisting of 26 European countries that captures the relationship between economic growth and retail payment instruments. In order to analyze the impact of retail payments instruments we used a Panel Regression Model. The retail payment instruments used are: cash, all cards, direct debit, credit transfers and cheques. We find that these instruments have a positive impact on economic growth, with cash exception. The greatest impact on economic growth for developed countries it have cheques and for emerging countries it have cards.*

**Keywords:** *retail payment system, economic growth, random effects*

**JEL Classification:** *C23 G01, G21*

## 1 INTRODUCTION

The evolution of payment systems will never cease as they play an important key role in the global circulation of money. Bank payment systems are social infrastructures that supports all economic activities, and based on this consideration the financial markets and banking systems resort to more sophisticated payment systems with high efficiency and grater safety (Andries, Mutu and Ursu, 2014). Payment systems are mechanisms that facilitate the transfer of funds between buyers

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and sellers and / or between banks. In modern society it comes to be confined the transfer of money. In this sense we can say that payment systems are one of the most important social infrastructures. Central banks and commercial banks play an important role in payment systems. People see a little role of payment systems and for this reason these systems are often seen as the work "behind the scenes" that the general public does not really consider important. But now settlement and payment systems present a great importance due to the dramatic increase in the level traded funds and also due to the development of computer technology.

The purpose of this empirical study is to analyze the impact of retail payment instruments (cash, credit cards, credit transfers, direct debit and cheques ) on the economic growth of 26 European countries. In this paper we investigate the impact of different methods of payment transactions on growth, considering both developed countries as well as emerging economies over the period 2000-2012.

The paper proceeds as follows. Section 2 provides a brief literature review and develops a set of research hypotheses to be tested in the paper. Section 3 summarises the data used. Section 4 describes the empirical methodology. Section 5 reports the empirical results. Section 6 concludes.

## **2 LITERATURE REVIEW**

The economics of payment systems connects several strands of literature such as, banking, financial economics, macroeconomics, monetary and regulatory economics (Andrieş, Cocriş and Ursu, 2012; Berger, 2003; Bolt, Humphrey and Uittenbogaard, 2008; De Young, 2005; Hasan, Schmiedel and Song, 2009; Scholnick et al., 2008).

Berger (2003) showed that technological development in the banking and financial system is related to significant productivity increases due to improvements in the services provided by banks. He found that the implementation of electronic payment instruments has significant effects in terms of gains in productivity and economies of scale. Humphrey et al. (2008) and Hasan et al. (2009) found that the development in the use of electronic payment systems is related to improvements in banking performance. These improvements are related not only to the cost side of banking operations but also to the revenue side (ECB and De Nederlandsche Bank, 2009).

Part of the literature on the economics of retail payments focuses on the role of payments system development and consumer choices. Humphrey et al. (2001)

developed a model to estimate consumers' demand for three point-of-sale payment instruments: checks, cash (as proxied by the quantity and price of ATM cash withdrawals) and the use of debit cards (EFTPOS).

Our empirical analysis is based on the study of Hasan et al. (2013). In this study, the authors examined the impact of various instruments of payment transactions on the real economy through the GMM methodology (Generalized Method of Moments), taking into account the 27 European countries in the period 1995-2009. The study takes into account the following variables: cash transactions, checks, direct debit operations, credit cards and credit transfers (expressed in millions EUR and as percentage of GDP), number of ATMs, number of POS, POS per million inhabitants, GDP / capita, the value of trade, inflation, interest rates on deposits, loans granted to the private sector as a percentage of GDP, the public expenses, the labor productivity, dummy variables for SEPA area and for eurozone. The results indicated that payment instruments, especially credit cards and credit transfers have a positive impact on the economy, by enhancing the GDP, trade and consumption. On the other hand, the results indicate that the transactions with checks have a low impact on the macroeconomic level. The results indicate that card transactions have the greatest influence on economic growth.

Worldwide it is desired effective parameters of payment systems to meet customer needs and requirements. Thus, we can only agree with the fact that payment instruments and market infrastructure facilitate the growth and development of economies, consumption and trade transactions. Customers have a wide range of payment methods which led to improved access to credit and funding (Visa, 2003). Meeting all these considerations we can formulate the following assumptions:

H1: retail instruments stimulate economic growth; and

H2: retail instruments from European developed countries stimulate economic growth much more than in emerging countries.

### 3 DATA ANALYSIS

Our sample includes 26 European countries which are analyzed for a period of 13 consecutive periods, respectively 2000-2012. Our sample include: Austria, Belgium, Bulgaria, Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Greece, Ireland, Italy, Lithuania, Latvia, Luxembourg, Britain, Portugal, the

Netherlands, Poland, Sweden, Finland, Romania, Hungary, Slovakia, Slovenia, Spain. Countries were selected based on data availability and were classified according to MSCI classification in developed and emerging countries. In this regard we introduced a dummy variable. The dummy variable for developed countries takes the value 1 and 0 for emerging countries.

The dependent variable that we want to explain is economic growth. Generally, we can say that the GDP growth rate indicates how fast an economy grows or how fast the GDP increases in the current year versus the previous year. The growth rate of GDP includes four components: consumption, investment, imports and exports (Pop Silaghi and Mutu, 2013). This indicator is important because it reflects how healthy an economy is.

In the present research we focused on the following retail payment instruments: credit card payments, direct debit or direct withdrawals, credit transfers, checks and cash (see Table 2 and Appendix 1). The value of cash transactions (as % of GDP) is not one of the variables of interest; it is used more for comparison between retail payment instruments. Also according to the literature we introduced several control variables: the interest rate on deposits, inflation and gross saving.

*Table 1* Dependent and explanatory variables list

<b>Indicator</b>	<b>Definition</b>	<b>Source</b>
Economic growth	Economic growth	World Development Indicators
Inflation rate	Price index (%)	World Development Indicators
Gross saving rate	Gross saving rate (% in GDP)	World Development Indicators
Deposit interest rate	Deposits interest rate	World Development Indicators
Cash	Transactions or cash withdrawals from terminals (% in GDP)	European Central Bank, Statistical Data
All cards	Transactions (% in GDP)	European Central Bank, Statistical Data
Credit transfers	Transactions (% in GDP)	European Central Bank, Statistical Data
Direct debit	Transactions (% in GDP)	European Central Bank, Statistical Data
Cheques	Transactions (% in GDP)	European Central Bank, Statistical Data

Source: authors' calculations

#### 4 METHODOLOGY

To identify the determinants for economic growth we have used a panel approach that includes 26 European countries over the period 2000-2012. The first step is to check the stationarity of the variables in the Panel Regression Model with Fisher Test. If the variables are not stationary we use first difference (see Appendix 1). Next we apply the Lagrange-Multiplier test for serial correlation because serial correlation causes the standard errors of the coefficients to be smaller than they actually are and higher R-squared. We accept the null and conclude that there is no serial correlation in our data.

In order to detect the presence of heteroskedasticity we have applied the Wald test. The null hypothesis is that of homoskedasticity or constant variance. Above we reject the null and conclude that heteroskedasticity is present in our data. In order to control heteroskedasticity we use the “robust” option proposed by Oscar Torres-Reyna (Oscar Torres-Reyna, 2011).

All regression captures the relationship between economic growth (as dependent variable) and retail payment indicators and others macroeconomic indicators (as explanatory variables). For each regression we have applied the random effects model (RE). We estimated this model both for developed and emerging countries.

The relationship between economic growth and retail payment, in the random effects model is the following:

$$\begin{aligned} \text{Economic growth}_{it} = & \\ & \alpha + \beta_1 * \text{Inflation rate}_{it} + \beta_2 * \text{Gross saving rate}_{it} + \\ & \beta_3 * \text{Deposit interest rate}_{it} + \beta_4 * \text{Cash}_{it} + (\delta_{it} + \varepsilon_{it}) \end{aligned} \quad (1)$$

$$\begin{aligned} \text{Economic growth}_{it} = & \\ & \alpha + \beta_1 * \text{inflation rate}_{it} + \beta_2 * \text{gross saving rate}_{it} + \\ & \beta_3 * \text{deposit interest rate}_{it} + \beta_4 * \text{all cards}_{it} + (\delta_{it} + \varepsilon_{it}) \end{aligned} \quad (2)$$

$$\begin{aligned} \text{Economic growth}P_{it} = & \\ & \alpha + \beta_1 * \text{inflation rate}_{it} + \beta_2 * \text{gross saving rate}_{it} + \\ & \beta_3 * \text{deposit interest rate}_{it} + \beta_4 * \text{credit transfers}_{it} + (\delta_{it} + \varepsilon_{it}) \end{aligned} \quad (3)$$

$$\begin{aligned} \text{Economic growth}_{it} = & \\ & \alpha + \beta_1 * \text{inflation rate}_{it} + \beta_2 * \text{gross saving rate}_{it} + \\ & \beta_3 * \text{deposit interest rate}_{it} + \beta_4 * \text{direct debit}_{it} + (\delta_{it} + \varepsilon_{it}) \end{aligned} \quad (4)$$

$$\begin{aligned}
 \text{Economic growth}_{it} = & \\
 & \alpha + \beta_1 * \text{inflation rate}_{it} + \beta_2 * \text{gross saving rate}_{it} + \\
 & \beta_3 * \text{deposit interest rate}_{it} + \beta_4 * \text{cheques}_{it} + (\delta_{it} + \varepsilon_{it}) \quad (5)
 \end{aligned}$$

$\text{Economic growth}_{it}$  is the dependent variable for country  $i$  at the moment  $t$ . inflation rate, gross saving rate, deposit interest rate, cash, all card, credit transfers, direct debit and cheques are the independent variables vectors for country  $i$  at moment  $t$ ,  $\alpha$  is the constant,  $\beta$  is the coefficient vector of independent variables,  $\delta_{it}$  represents the random effect for country  $i$  and  $\varepsilon_{it}$  is the error.

## 5 RESULTS

In order to identify the most suitable panel model we have applied the Hausman test. This test examines if individual effects are uncorrelated with any regressor in the model. This test compares the fixed effect model with the random effect model. If the null hypothesis is rejected, we can conclude that the fixed effect model is better than the random effect model. After applying the Hausman test we obtained in all cases probabilities greater than 5%, therefore it is indicated to use a panel with random effects. Based on the results of this test, in Tables 2 and 3 we present the retail payment indicators and other macroeconomic factors which influence economic growth.

**Table 2** Determinants of economic growth for European developed countries

Explanatory variables	Cash	All cards	Credit transfers	Direct debit	Cheques
Inflation rate	-0.175	-0.167	-0.164	-0.160	-0.228
Gross saving rate	0.495***	0.494***	0.577***	0.558**	0.622***
Deposit interest rate	0.239	0.219	0.219	0.227	0.328*
Cash	-0.019				
All cards		0.034*			
Credit transfers			-0.001		
Direct debit				0.005	
Cheques					0.105**
Const.	-0.540	-0.392	-0.385	-0.564	-0.365
R-squared for within model	0.231	0.224	0.257	0.246	0.279
R-squared for overall model	0.217	0.215	0.245	0.237	0.262

Source: authors' calculations

From the table above it could be seen that all cards, cheques, direct debit, gross saving rate and inflation have an impact on economic growth. Studying the regression results we could observe a direct relationship between the economic growth and retail payment indicators, according to the initial hypothesis settings. The greatest impact on

economic growth is played by the card penetration in both developed countries and emerging countries. In developed countries, if the penetration rate card increases by 1% the economic growth increase by 3.4%, and for emerging countries, if card penetration rate increases by 1% then economic growth increase by 10.9%.

The coefficient for direct debit is significant only for emerging countries. If the penetration rate for direct debit increases by 1% the economic growth increases by 3.3%. In developed countries, if the penetration rate for cheques increases by 1% the economic growth increases by 10.5%. For the emerging countries, if card penetration rate increases by 1% then economic growth increases by 0.6%. Based on the above results we can say that the greatest impact on economic growth for developed countries it have cheques and for emerging countries it have cards.

Regarding the control variables the empirical results show that inflation has an inverse impact on GDP growth, while gross saving rate and the interest rate on deposits have a positive impact. If inflation increases means lowers purchasing power of the population and an increase of prices, so with the same amount people will buy fewer goods which lowers the consumption and hence the GDP. The saving rate of population increases due to higher household incomes and welfare, so that economic growth and the saving rate should have a positive relationship. Commercial banks grant loans based on deposits level so that an increase in the interest rate on deposits should stimulate the granting of loans which would enhance consumption and therefore the economic growth. The Gross saving rate is the most significant having the greatest impact on the economic growth.

**Table 3** Determinants of economic growth for European emerging countries

Explanatory variables	Cash	All cards	Credit transfer s	Direct debi t	Cheques
Inflation rate	-0.327	-0.314	-0.346	-0.321	-0.417*
Gross saving rate	0.387**	0.362**	0.356**	0.350**	0.169
Deposit interest rate	-0.120	0.173	-0.181	-0.191	-0.333*
Cash	-0.013				
All cards		0.109**			
Credit transfers			0.000		
Direct debit				0.033*	
Cheques					0.006**
Const.	0.732	0.697	0.864	0.776	0.570
R-squared for within model	0.320	0.319	0.323	0.333	0.352
R-squared for overall model	0.257	0.249	0.253	0.257	0.296

Source: authors' calculations

## 6 CONCLUSIONS

We developed a panel framework consisting of 26 European countries that captures the relationship between economic growth and retail payment instruments. The retail payment instruments used are: cash, all cards, direct debit, credit transfers and cheques. In the developed countries case the largest impact on economic growth is attributed to the penetration rate of cheques, while in emerging economies the largest impact on economic growth has penetration rate of all cards.. Direct debit instruments have a much greater impact in developing countries compared to emerging countries. From a policy perspective, our paper supports the adoption of policies that encourage the usage and adoption of electronic retail payment instruments. Increasing the retail payments instruments can be expected to lead to positive macroeconomic effects and an increased GDP per capita.

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## APPENDIX

### Appendix 1. Unit root test: Im-Pesaran-Shin

Variables	IPS statistics	p-value
cash	0.0451	[0.5180]
cash-first difference	-2.2648	[0.0118]
all cards	3.3800	[0.9996]
all cards-first difference	-4.3678	[0.0000]
credit transfer	-1.4118	[0.0790]
credit transfer-first difference	-2.3578	[0.0000]
direct debit	0.2385	[0.5943]
direct debit - first difference	-1.3678	[0.0010]
cheques	-2.3600	[0.1201]
cheques - first difference	-1.3478	[0.0011]
inflation rate	-6.5325	[0.0000]
deposit interest rate	-2.5425	[0.0000]
gross saving rate	-0.9601	[0.1685]
gross saving rate – first difference	-2.5474	[0.0054]

Source: authors' calculations





# CONTRIBUTION TO SYSTEMIC RISK OF THE EUROPEAN BANKING GROUPS WITH SUBSIDIARIES IN CENTRAL AND EASTERN EUROPE

Simona MUTU\*

**Abstract:** *This paper investigates the systemic risk within banking groups from the Euro zone with subsidiaries in Central and Eastern Europe during the 2001-2010 period. In order to capture the extreme movements we have modeled the data through tail risk measures and semi-parametric quantile regression. The results show that systemic risk is time-varying in respect with each bank individual risk and a set of indices representative for the European financial markets. Risk measures are higher and more volatile after the 2008 financial crisis, in comparison with the pre-crisis period. Greek banks have the largest contribution to systemic risk, followed by banks from France, Italy and Germany.*

**Keywords:** *systemic risk, Conditional Value at Risk, quantile regression, tail risk, capital adequacy, CEE cross-border banking*

**JEL classification:** *C22, C51, G01, G21, G32*

## 1 INTRODUCTION

Western Euro zone banks' holdings in Central and Eastern European (CEE) have increased dramatically in recent years. In spite of the traditional banking business model mainly based on deposits taking and lending activities, banks from CEE zone have become highly exposed to the risk generated by their parent banks during the most recent financial crisis (Allen et al., 2011; Schoenmaker and Wagner, 2011). If a decade ago each bank from the CEE zone could have been viewed in isolation, at this moment they are highly influenced by the international markets and especially by the common evolution of their parent banks. In the same time, due to

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common exposures the parent banks activating in the CEE area have also increased their sensitivity financial vulnerabilities (Andrieș, Cocriș and Ursu, 2012).

Given these characteristics, the aim of this paper is to assess the systemic risk within the banking groups with subsidiaries in the CEE zone and to determine each bank's contribution to systemic risk. Banks we focus on hold more than 90% of the banking system in countries like Albania, Bulgaria, Croatia, Macedonia, Poland, Romania, Serbia, Slovakia, Slovenia and Hungary. An aggravation of the crisis in the Euro zone would first translate into parent banks blocking their subsidiaries' access to funding lines.

The systemic risk and contagion effects are estimated within a Quantile Regression framework. The entry data is represented by quarterly balance sheet items, weekly price quotes and market indices representative for the European interbank, capital and governmental bonds markets for the period 01.01.2001 – 31.12.2010. Following the methodology proposed by Adrian and Brunnermeier (2011), each bank's contribution to systemic risk will be determined as the difference between the maximum possible loss of the system conditioned on the event that each bank will face the most severe loss and the maximum possible loss of the system conditioned on the event that each bank register median levels of possible losses.

Studies regarding systemic risk prior to 2008 financial crisis have focused on contagion effects, analyzing the probability that financial institutions simultaneously record a certain level of losses generated by liquidity or credit risk. In the post-crisis period an increasing number of studies have highlighted the implications of market risk on the systemic risk, stressing the importance of increasing the models' sensitivity to short-term market changes.

Acharya et al. (2010) proposed the *Systemic Expected Shortfall (SES)* that captures the expected contribution of a bank to the systemic risk when the whole system is undercapitalized and the *Marginal Expected Shortfall (MES)* that reflects the expected loss of a firm when the system is undercapitalized. Brownlees and Engle (2010) have estimated MES using a TARARCH model for the volatility of equity prices, a multivariate DCC GARCH model for the correlations between firm returns and market returns and non-parametric estimations for the tails' comovements. They found that MES is proportional with the banks' leverage level, which is more severe when the market conditions worsen. Using a Logit

framework, Trenca, Petria and Corovei (2014) proposed an early warning system for the European banking sector.

Adrian and Brunnermeier (2011) propose the Conditional Value at Risk (CoVaR) approach to analyze the systemic risk. Chan-Lau (2010) applied this methodology to examine the contagion effects within financial institutions from USA, Europe and Japan using CDS spreads. Wong and Fong (2010) have used the CoVaR approach for studying the interconnectivity between 11 Asian-Pacific economies. Hautsch et al.(2011) have analyzed systemic risk of the USA financial market using two-stage quantile regression and the bootstrapping procedure for correcting the estimation errors generated by using pre-estimated regressors.

Despite the significant number of research papers that treated the systemic risk for the USA financial market, not so many papers investigated the systemic risk on the European market in the recent period. Using a multinomial logit model, Gropp et al. (2009) found evidence of significant cross-border contagion among large European banks after estimating the coexceedances of large shocks for a sample of 40 banks in the 1994 - 2003 period, taking into account tail observations of distance to default. Coccozza and Piselli (2011) found that contagion risk across European banks heightened significantly during the recent crisis, using daily distance to default of 33 Western and Eastern European banks, in the January 2003 – March 2009 period.

Our goal is to contribute to the existing literature in several ways. First, we investigate the systemic risk within a unique sample of cross-border banks with subsidiaries in emerging CEE countries. Second, we analyze the maximum possible loss of the banks' market valued total assets conditioned on specific extreme movements that took place on the European interbank markets, capital markets and governmental bonds markets, in order to reflect the time varying nature of risk. Third, we estimate banks' contribution to systemic risk using a large and unique set of data consisting of quarterly balance sheet items and weekly market variables.

The remainder of paper is organized as follows. Section 2 presents the methodology used. Section 3 describes the sample and data. Section 4 discusses the empirical results. Section 5 holds the conclusions.

## 2 METHODOLOGY

The empirical strategy resides in estimating the contagion effects in distressed periods within the group of parent banks that hold subsidiaries in CEE banking. Observing the extensive methodologies discussed in the literature that use the liquidity, the volatility, the undercapitalization or the contamination between financial institutions as systemic risk regressors, we focus on the loss generated from the reduction of the market valued total assets of banks under a certain threshold, in line with the approach of Adrian and Brunnermeier (2011).

First we estimate the risk of a reduction in the market valued total assets for each bank of our sample, calculating the *Value at Risk (VaR)* indicator developed by Jorion (1997), Dowd (1998) and Saunders (1999). VaR is the maximum possible loss that a bank registers for a given confidence level  $\alpha$  (usually 95% or 99%), over a specific period of time. Second, we determine the *Conditional Value at Risk (CoVaR)* indicator which reflects the VaR of the system conditional on each bank's own level of risk (Adrian and Brunnermeier, 2011).

The estimations of VaR and CoVaR can efficiently be done using the Quantile Regression technique proposed by Bassett and Koenker (1978). The method resides in estimating the dependent variable's quantiles conditioned on the explanatory variables (in our case the most negative 1% or 5% of observations, for a 99% confidence level, and, respectively, for a 95% confidence level).

To capture the time variation of banks' contribution to systemic risk we estimate the VaR and CoVaR indicators on a weekly base, conditioned on five market indices ( $I_p^j, j=1, \dots, 5$ ) that incorporates information representative for the volatility and liquidity of the European banking market. The definition of the market indices is given in Section 3.

Their causality relationship with the market valued total assets growth rates of the banking system were analyzed through the *Granger causality Test*. This is a joint test that the first lag of the determinant is distributed as an F distribution (Granger, 1969), by estimating the following regression:

$$R_{AMV,t}^{sys} = \mu + \sum_{\tau=0}^k (\alpha_{\tau} \times I_{p,t-\tau}^j) + \varepsilon_t \quad (1)$$

where  $R_{AMV,t}^{sys}$  is the market valued assets growth rate of the entire system at moment  $t$ ,  $k$  is the lag order and  $\varepsilon_t$  is the disturbance error term. The null and the alternative hypothesis tested are  $H_0: \alpha_1 = \alpha_2 = \dots = \alpha_k = 0$  (lagged values of the market indices  $I_p^j$  ( $j=1, \dots, 5$ ) don't cause  $R_{AMV,t}^{sys}$  in the Granger sense) and  $H_1: \exists \alpha_\tau \neq 0$  (lagged values of the market indices  $I_p^j$  ( $j=1, \dots, 5$ ) cause  $R_{AMV,t}^{sys}$  in the Granger sense).

We use the next linear relationship model for capturing the dependence of market valued total assets growth rate of each bank on the market indices ( $I_p^j, j=1, \dots, 5$ ), estimated on a weekly basis:

$$R_{AMV,t}^i = \alpha^i + \beta_1^i DJESFI_{t-1} + \beta_2^i LqSpread_{t-1} + \beta_3^i Euribor3M_{t-1} + \beta_4^i GovB_{t-1} + \beta_5^i SwapSpread_{t-1} + \varepsilon_t^i \quad (2)$$

where  $R_{AMV,t}^i$  is the market valued assets growth rate for bank  $i$  at moment  $t$ ,  $\alpha^i$  captures each bank specific characteristics,  $\beta_j^i$  captures the bank  $i$ 's dependence relationship with the one week lagged market indices  $I_{p,t-1}^j$  ( $j=1, \dots, 5$ ) and  $\varepsilon_t^i$  is an *iid* error term specific to each bank.

Running the **Quantile Regression method** on equation (2) for the 1% quantile, 5% quantile and for the median of the  $R_{AMV,t}^i$  distribution we obtain the values of the regressors  $\hat{\alpha}^i$  și  $\hat{\beta}_j^i$ , ( $j=1, \dots, 5$ ) that we will use to calculate VaR and median for each bank:

$$\widehat{VaR}_{q,t}^i = \hat{\alpha}^i + \sum_{j=1}^5 (\hat{\beta}_j^i \times I_{p,t-1}^j) \quad (3)$$

$$\hat{R}_{AMV,t}^i(50\%) = \hat{\alpha}^i + \sum_{j=1}^5 (\hat{\beta}_j^i \times I_{p,t-1}^j) \quad (4)$$

where  $q$  is the significance level.

The risk of the entire system modifies with each bank's risk from the sample over the analyzed period and also with the market indices, as in the following relationship:

$$R_{AMV,t}^{sys|i} = \alpha^{sys|i} + \beta_1^{sys|i} DJESFI_{t-1} + \beta_2^{sys|i} LqSpread_{t-1} + \beta_3^{sys|i} Euribor3M_{t-1} + \beta_4^{sys|i} GovB_{t-1} + \beta_5^{sys|i} SwapSpread_{t-1} + \delta^{sys|i} \times R_{AMV,t}^i + \varepsilon_t^{sys|i} \quad (5)$$

where  $\alpha^{sys|i}$  captures the banking system characteristics,  $\beta_j^{sys|i}$  captures the system dependence relationship with the one week lagged market indices  $I_{p,t-1}^j$

( $j=1, \dots, 5$ ),  $\delta^{sys|i}$  reflects the relation with each bank's market valued asset growth rate and  $\varepsilon_t^{sys|i}$  is an *iid* error term.

Running the Quantile Regression method on equation (5) for the 1% quantile, 5% quantile and for the median of the  $R_{AMV,t}^{sys|i}$  distribution we obtain the values of the regressors  $\alpha^{sys|i}$  and  $\beta_j^{sys|i}$ , ( $j=1, \dots, 5$ ) and  $\delta^{sys|i}$  that we will use to calculate CoVaR for each bank in the stressed period ( $q=1\%$  or  $q=5\%$ ) and in the normal period ( $q=50\%$ ):

$$\widehat{CoVaR}_{q,t}^{sys|i(q)} = \hat{\alpha}^{sys|i} + \sum_{j=1}^5 (\hat{\beta}_j^{sys|i} \times I_{p,t-1}^j) + \hat{\delta}^{sys|i} \times \widehat{VaR}_{q,t}^i \quad (6)$$

$$\widehat{CoVaR}_{q,t}^{sys|i(50\%)} = \hat{\alpha}^{sys|i} + \sum_{j=1}^5 (\hat{\beta}_j^{sys|i} \times I_{p,t-1}^j) + \hat{\delta}^{sys|i} \times \widehat{VaR}_{50\%,t}^i \quad (7)$$

Finally, we will determine each bank's contribution to the systemic risk as the difference between VaR of the system conditioned on the event that each bank face the most negative assets growth rates and VaR of the system conditioned on the event that each bank register the median value of the assets growth rate, at a given confidence level.

### 3 DATA

Our sample consists of 20 banks from the Euro Zone that hold more than 90% of the total banking assets in the emerging CEE countries. This group includes leading international banks and also institutions from distressed financial areas confronted with sovereign debt crisis in the beginning of 2010, such as Greece, Spain, Portugal and Italy. A ranking of the banks by total assets held at 31.12.2010 is given in Table 1.

**Table 1** Euro Zone banks with subsidiaries in CEE ranked by Total Assets

Rank	Bank	Symbol	Headquarter	Total assets (bil. €)
1	BNP Paribas	BNP	France	1,988.92
2	ING Group	ING	Holland	1,235.26
3	Santander Group	SAN	Spain	1,200.41
4	Societe Generale Group	GLE	France	1,127.21
5	Unicredit Group	UCG	Italy	918.20
6	Commerz Bank	CBK	Germany	750.73
7	Intensa Sanpaolo Group	ISP	Italy	652.78
8	Dexia Group	DEXB	Belgium	564.03

Rank	Bank	Symbol	Headquarter	Total assets (bil. €)
9	KBC Group	KBC	Belgium	318.46
10	Erste Bank Group	EBS	Austria	205.52
11	Bayern LB Bank Group	BEB2	Germany	130.76
12	Raiffeisen Group	RBI	Austria	130.71
13	National Bank of Greece	NBG	Greece	120.02
14	BCP Millennium	BCP	Portugal	99.32
15	EFG Eurobank	EUROB	Greece	86.69
16	Alpha Group	ALPHA	Greece	66.37
17	Piraeus Bank Group	TPEIR	Greece	57.26
18	OTP Group	OTPD	Hungary	35.14
19	Emporiki Bank	TEMP	Greece	26.49
20	Volksbank Group	VVPS	Austria	2.48

Note: Total Assets are in billions euro at the end of 2010. Data are extracted from Worldscope.

The tail risk measures are estimated for each bank individually using market valued assets growth rates with weekly frequency. This corresponds to a total number of 10.195 observations for 522 weeks during the 01.01.2001 – 31.12.2010 period. The quarterly Total Assets and Equity (book value) are extracted from the Balance Sheet Reports of Worldscope. The weekly Market Capitalization (market value of Equity) is retrieved from Datastream. The quarterly frequency of the balance sheet variables is transformed into weekly frequency through linear interpolation between two consecutive quarters. The computational details are given in Table 2.

**Table 2** Balance Sheet variables

Variable	Description	Calculation
MTB	Market to Book ratio of equity	Equity (market value) / Equity (book value)
Equity <sub>MV</sub>	Equity (market value)	Shares outstanding · Weekly Price
LEV	Leverage	Total assets (book value) / Equity (book value)
Assets <sub>MV</sub>	Assets (market value)	Equity <sub>MV</sub> · LEV
$R_{AMV,t}^i$	Assets growth rate (market value) of bank i at moment t	$(Assets_{MV} / Assets_{MV}) - 1$
$R_{AMV,t}^{sys}$	Assets growth rate (market value) of the entire system at moment t	$R_{AMV,t}^{sys} = \sum_i \frac{Assets_{MV,t}^i}{\sum_i Assets_{MV,t}^i} R_{AMV,t}^i$

Note: Data extracted from the Datastream Market Reports and Worldscope Balance Sheet Reports.

Due to increased stress and extreme volatilities registered on the international markets, the evolution of the market valued total assets registered a downward path since the fourth quarter of 2008. Table 3 reports the descriptive statistics of the market valued assets growth rates of each bank. It can be remarked the large values of volatilities and kurtosis corresponding with fat-tailed data that captures extreme variations taking place on the European banking markets.

**Table 3** Descriptive statistics of market valued assets growth rates for each bank and for the system

<b>Bank</b>	<b>Mean</b>	<b>Median</b>	<b>St. dev.</b>	<b>Skewness</b>	<b>Kurtosis</b>
EBS	0.003	0.004	0.062	0.035	12.911
RBI	0.004	0.007	0.075	-0.653	9.925
VVPS	0.001	0.001	0.006	0.516	67.025
UCG	0.001	0.003	0.058	-0.111	11.040
ISP	0.000	0.000	0.058	-0.240	6.279
OTPD	0.005	0.001	0.098	0.926	26.483
ING	0.001	0.003	0.074	-0.482	7.884
KBC	0.002	0.001	0.077	0.298	17.934
DEXB	0.001	0.001	0.072	1.720	18.538
BCP	-0.004	-0.005	0.047	0.071	5.066
SAN	0.002	0.002	0.050	-0.035	7.367
BEB2	0.002	-0.001	0.062	-0.074	7.218
CBK	0.000	-0.001	0.075	1.466	18.856
BNP	0.002	0.003	0.059	0.364	12.130
GLE	0.001	0.000	0.062	-0.029	5.758
NBG	0.000	-0.001	0.062	0.375	10.585
EUROB	0.001	0.003	0.057	-0.064	5.661
ALPHA	-0.001	0.002	0.058	-0.168	4.976
TPEIR	0.001	0.001	0.060	-0.001	4.796
TEMP	0.005	0.002	0.104	44.866	7.781
System	0.003	0.005	0.051	0.987	14.222

Note: The market valued market valued assets growth rates are determined by adjusting the total assets with the ratio between equity (market value) and equity (book value).

The market valued assets descending evolution of the Euro Zone banks with subsidiaries in CEE is highly connected with a set of financial variables representative for the European interbank, capital and governmental bonds

markets. In order to account the impact of these variables on the systemic risk we have used weekly market indices for the 01.01.2001 – 31.12.2010 period, extracted from the Statistical Data Warehouse of the European Central Bank. Table 4 reports the market variables and the transformations necessary to be made in order to become stationary.

*Table 4* Market indices

Variable	Description	Calculation
DJESFI	Dow Jones Euro Stoxx Financials Index	$\ln(\text{DJESFI}_t/\text{DJESFI}_{t-1})$
LqSpread	Liquidity spread between 3M Euribor and the ECB's main refinancing operations rate	$\Delta(\text{Euribor}_{3M} - \text{MRO})$
Euribor3M	3-month Euribor	$\ln(\text{Euribor}_{3M(t)}/\text{Euribor}_{3M(t-1)})$
GovB	Euro area 10-year Government Bonds Benchmark yield	$\ln(\text{GovB}_{10y(t)}/\text{GovB}_{10y(t-1)})$
SwapSpread	Spread between 6-month Eoniaswap and a 10-year maturity Bonds Benchmark of the	$\ln(\text{SwapSpread}_t/\text{SwapSpread}_{t-1})$

Note: Weekly data extracted from the Statistical Data Warehouse of the European Central Bank.

## 4 EMPIRICAL RESULTS

### 4.1 The Impact of Market Indices: Granger Test Results

The results of Granger causality tests presented in Table 5 highlight the existence of causality relationships between the market indices and the growth rates of the market valued total assets. The  $p$ -values associated with the F-statistic suggest the rejection of the null hypothesis that lagged values of market indices don't cause in the Granger sense the assets growth rates for the banking system analyzed. Thus, the liquidity and volatility of the European capital markets, governmental bonds markets and interbank money markets are directly reflected in the market valued assets growth rates evolution.

*Table 5* Causality between European market indices and the system's market valued assets growth rates

Dependent variable	Excluded variable	F-statistic
$R_{AMV,t}^{sys}$	DJESFI	86.9658***

$R_{AMV,t}^{SYS}$	LqSpread	85.5545***
$R_{AMV,t}^{SYS}$	Euribor3M	201.524***
$R_{AMV,t}^{SYS}$	GovB	16.6577***
$R_{AMV,t}^{SYS}$	SwapSpread	145.042***

Note: The table reports the Pairwise Granger Causality Test with 2 lags included. The null hypothesis tested is  $H_0$ : lagged values of the market indices  $I_p^j$  ( $j=1, \dots, 5$ ) do not cause  $R_{AMV,t}^{SYS}$ .

#### 4.2 Value at Risk Estimations Using Quantile Regression

Table 6 reports the results of the 5% quantile regression between the market valued total assets growth rate of each bank conditioned on the one week lagged market indices. The coefficients are statistically significant especially for the Dow Jones Euro Stoxx Financials Index, for the 3 month Euribor interbank interest rate and in half of the cases for the spread between the 6 month Eoniaswap rate and the Euro area benchmark bonds with 10 years maturity. The liquidity spread between the 3 month Euribor and the main refinancing operations rate practiced by ECB is statistically significant for six banks and the Euro area 10 years Government Bonds Benchmark yield is significant just for three banks. The fit of the regressions is measured through the Pseudo  $R^2$  which range from 10% to 20% for most banks from the sample.

**Table 6** Value at Risk estimations using quantile regression

$R_{AMV,t}^i$	c	DJESFI <sub>t-1</sub>	LqSpread <sub>t-1</sub>	Euribor3M <sub>t-1</sub>	GovB <sub>t-1</sub>	SwapSpread <sub>t-1</sub>	Pseudo $R^2$
EBS	- (0,005)	1,2572** (0,319)	-0,0302*** (0,010)	1,6119*** (0,394)	-0,0746 (0,301)	0,0031 (0,040)	0.16
RBI	- (0,008)	1,0654** (0,294)	0,0072 (0,015)	1,8216*** (0,441)	0,0892 (0,369)	0,0649 (0,040)	0.19
VVPS	- (0,001)	-0,0090 (0,009)	0,0030*** (0,003)	-0,0118 (0,009)	-0,0046 (0,015)	-0,0001 (0,001)	0.04
UCG	- (0,006)	1,8966** (0,356)	-0,0022 (0,008)	1,6302*** (0,265)	0,1396 (0,207)	-0,0342** (0,017)	0.24
ISP	- (0,004)	1,5415** (0,171)	-0,0119 (0,012)	0,6483*** (0,177)	0,3242 (0,507)	0,0066** (0,028)	0.19
OTPD	- (0,017)	1,9444** (0,405)	-0,0745*** (0,023)	0,9679** (0,487)	0,3720 (0,400)	-0,0030 (0,044)	0.17

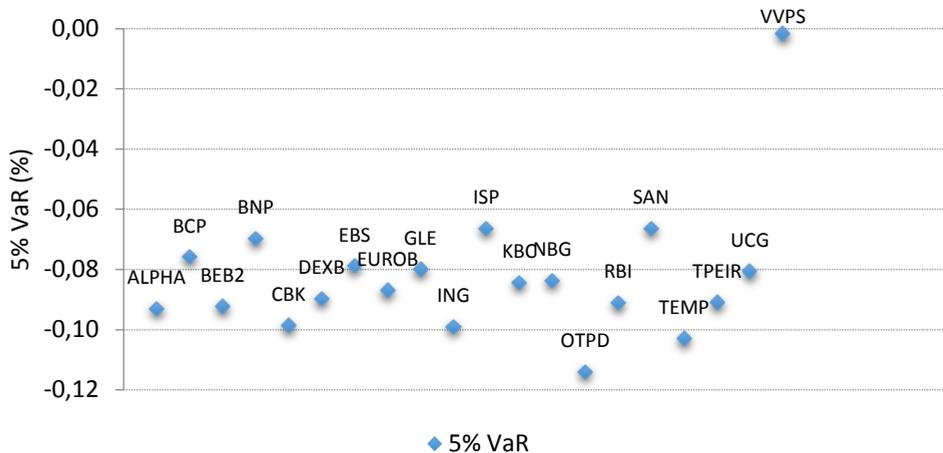
$R_{AMV,t}^i$	c	DJESFI <sub>t-1</sub>	LqSpread <sub>t-1</sub>	Euribor3M <sub>t-1</sub>	GovB <sub>t-1</sub>	SwapSpread <sub>t-1</sub>	Pseudo R <sup>2</sup>
ING	-	1,7455**	0,0126	2,1675***	-0,3051	0,0150	0.22
	(0,008)	(0,624)	(0,020)	(0,372)	(0,456)	(0,035)	
KBC	-	0,9515**	0,0166	2,5158***	-0,1705	0,0467***	0.24
	(0,007)	(0,318)	(0,014)	(0,246)	(0,215)	(0,014)	
DEXB	-	1,5224**	0,0087	2,1211***	-0,3471	0,0587***	0.22
	(0,007)	(0,360)	(0,013)	(0,288)	(0,374)	(0,021)	
BCP	-	1,0911**	-0,0231**	0,8857*	-0,1072	-0,0327*	0.14
	(0,005)	(0,206)	(0,009)	(0,498)	(0,315)	(0,018)	
SAN	-	1,5415**	-0,0119	0,6483***	0,3242	0,0066	0.24
	(0,003)	(0,269)	(0,008)	(0,149)	(0,198)	(0,011)	
BEB2	-	1,5448**	-0,0068	2,0657***	0,0093	-0,0816*	0.15
	(0,006)	(0,544)	(0,021)	(0,332)	(1,026)	(0,046)	
CBK	-	1,6148**	-0,0232	1,1346**	-0,4318	-0,0150	0.17
	(0,007)	(0,211)	(0,023)	(0,501)	(0,360)	(0,017)	
BNP	-	1,2070**	-0,0134	1,4328***	0,2797*	0,0204	0.22
	(0,003)	(0,205)	(0,010)	(0,225)	(0,144)	(0,013)	
GLE	-	1,5225**	-0,0012	1,1898***	0,5203**	0,0342***	0.25
	(0,0049)	(0,205)	(0,012)	(0,184)	(0,211)	(0,012)	
NBG	-	1,1773**	0,0090	0,8282**	-0,5614	-0,0194	0.09
	(0,008)	(0,311)	(0,016)	(0,415)	(0,459)	(0,017)	
EUROB	-	0,8073**	0,0205*	0,6133***	-	0,0047	0.11
	(0,005)	(0,210)	(0,0109)	(0,173)	(0,230)	(0,009)	
ALPHA	-	1,4050**	0,0190	1,3691**	0,2877	-0,0155	0.14
	(0,006)	(0,399)	(0,016)	(0,584)	(0,433)	(0,048)	
TPEIR	-	1,2767**	0,0111	0,2872	0,2702	0,0191*	0.11
	(0,007)	(0,387)	(0,019)	(0,306)	(0,414)	(0,011)	
TEMP	-	0,3928	0,0530***	2,7759***	-0,6929	0,0798***	0.08
	(0,010)	(0,368)	(0,019)	(0,615)	(0,498)	(0,027)	
System	-	0,9501**	0,0089	1,4712***	-0,0581	0,0198**	0.26
	(0,004)	(0,1520)	(0,008)	(0,121)	(0,131)	(0,009)	

Note: 5% Quantile Regression with Huber Sandwich method for computing the covariance matrix, Kernel (residual) for Sparsity estimation, Hall-Sheather Bandwidth method, Rankit (Cleveland) method for computing empirical quantiles and Epanechnikov kernel function. Pseudo R<sup>2</sup> represents Koenker and Machado (1999) goodness-of-fit measure.

\*\*\* significant at 1% level, \*\*significant at 5% level, \* significant at 10% level.

Standard error in (). (-1) denotes one week lag.

We have also estimated the relationship of the extreme values by running the 1% quantile regression method (which results are available upon request). The statistical results are very similar with those obtained when running the 5% quantile regression.



**Figure 1** 5% Value at Risk during 15.09.2008 – 31.12.2010

Note: The table reports the average Value at Risk indicators for each bank during 15.09.2008 – 31.12.2010. The estimations are run using the 5% Quantile Regression method.

Using the estimated values of the coefficients obtained after running the 5% and the 1% quantile regressions we have calculated the weekly Value at Risk indicators at the 95% and 99% confidence level for each bank and also for the entire system. The graphs presented in Appendix 1 show the time-varying evolution of the maximum possible loss at the given confidence levels and also the increasing loss after the 2008 market turbulences.

A comparison of the average maximum possible losses at the 5% significance level during 2008-2010 reveals that most of them range between 7%-10% of the total marked valued assets (Figure 1). The Austrian bank Volksbank reports the lowest average possible loss (0.16%), while OTP Group the highest (11.39%). At the 99% confidence level the average VaR ranges between 10%-15% of the total marked valued assets. The Greek bank Emporiki registers the highest average maximum possible loss (28.53%).

### 4.3 Systemic risk estimation using quantile regression

In Table 7 are reported the results of the 5% quantile regression for the market valued total assets growth rate of the sample conditioned on the one week lagged market indices and also on the market valued total assets growth rate of each bank. The most statistically significant coefficients correspond to the Dow Jones Euro Stoxx Financials Index, to the 3 months Euribor interbank interest rate and as expected to the individual assets growth rate of each bank. The conditioning of the system's most negative growth rates on each bank's negative extreme values captures better the systemic risk, which is reflected in higher Pseudo  $R^2$  values. The results obtained after running a 1% quantile regression (available upon request) are very similar.

*Table 7* Conditional Value at Risk estimations using quantile regression

$R_{AMV,t}^{sys i}$	$c$	DJESFI t-1	LqSpread t-1	Euribor3M t-1	GovB t-1	SwapSpread t-1	$R_{AMV,t}^i$	Pseudo $R^2$
EBS	- (0,003)	0,8927*** (0,146)	0,0188*** (0,007)	0,9447*** (0,129)	0,0790 (0,122)	0,0248*** (0,008)	0,4825*** (0,062)	0.44
RBI	- (0,004)	0,8444*** (0,226)	0,0249** (0,010)	0,6407*** (0,187)	0,0144 (0,166)	-0,0040 (0,012)	0,4185*** (0,064)	0.51
VVPS	- (0,004)	0,9703*** (0,164)	0,0099 (0,009)	1,4205*** (0,124)	-0,0336 (0,139)	0,0197** (0,009)	0,7671* (0,192)	0.26
UCG	- (0,002)	0,6971*** (0,235)	-0,0042 (0,011)	0,6692*** (0,252)	0,1344 (0,261)	0,0023 (0,015)	0,6747*** (0,053)	0.54
ISP	- (0,003)	0,6261*** (0,158)	-0,0142 (0,011)	1,0050*** (0,133)	-0,0469 (0,313)	0,0102 (0,010)	0,4084*** (0,040)	0.43
OTPD	- (0,005)	0,9016*** (0,200)	0,0086 (0,010)	1,2685*** (0,132)	0,0016 (0,164)	0,0314*** (0,010)	0,0678*** (0,013)	0.28
ING	- (0,002)	0,4649*** (0,098)	0,0014 (0,005)	0,2957*** (0,075)	0,1073 (0,065)	0,0026 (0,007)	0,5047*** (0,032)	0.59
KBC	- (0,002)	0,7599*** (0,174)	0,0118** (0,005)	0,8139*** (0,270)	0,0969 (0,213)	0,0165 (0,035)	0,4498*** (0,040)	0.51
DEXB	- (0,004)	0,7295*** (0,150)	-0,0032 (0,007)	0,7220*** (0,260)	-0,0081 (0,152)	-0,0179 (0,014)	0,4978*** (0,063)	0.48
BCP	- (0,004)	1,0297*** (0,222)	0,0024 (0,007)	1,0064*** (0,145)	- (0,149)	0,0014 (0,009)	0,4658*** (0,061)	0.36

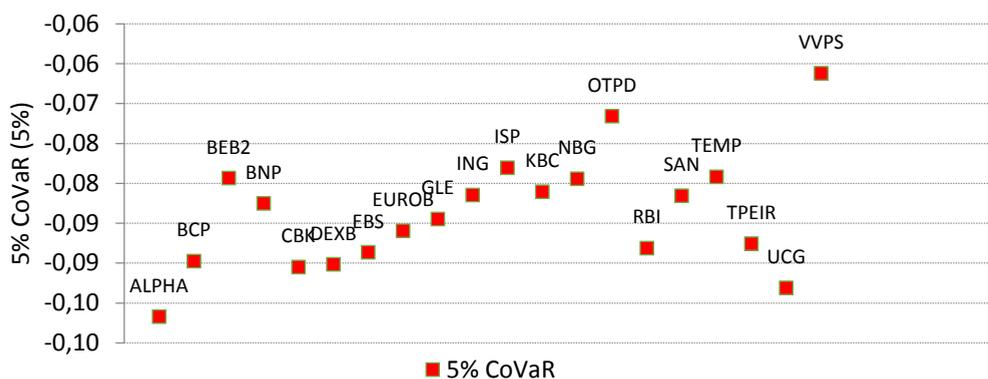
$R_{AMV,t}^{sys i}$	c	DJESFI	LqSpread	Euribor3M	GovB	SwapSpread	$R_{AMV,t}^i$	Pseudo $R^2$
		t-1	t-1	t-1	t-1	t-1		
SAN	-	0,6098*** (0,003)	-0,0086 (0,007)	0,9311*** (0,134)	0,0532 (0,128)	0,0311*** (0,010)	0,6006*** (0,043)	0.53
BEB2	-	0,9853*** (0,004)	0,0041 (0,007)	1,0888*** (0,182)	0,2018 (0,136)	0,0258** (0,011)	0,2018*** (0,041)	0.29
CBK	-	0,9015*** (0,004)	0,0153 (0,010)	0,9801*** (0,208)	-0,0630 (0,178)	-0,0065 (0,009)	0,4155*** (0,054)	0.43
BNP	-	0,7335*** (0,003)	0,0028 (0,007)	0,5852*** (0,156)	0,2053 (0,500)	0,0217 (0,011)	0,6791*** (0,068)	0.58
GLE	-	0,5983*** (0,002)	-0,0049 (0,008)	0,3349*** (0,110)	0,1276 (0,244)	-0,0094 (0,017)	0,6180*** (0,041)	0.56
NBG	-	0,8182*** (0,004)	0,0151** (0,006)	1,0541*** (0,149)	0,1343 (0,126)	0,0166** (0,008)	0,3317*** (0,024)	0.38
EUROB	-	0,8909*** (0,003)	0,0013 (0,006)	0,9057*** (0,171)	0,0638 (0,136)	0,0057 (0,008)	0,4119*** (0,053)	0.38
ALPHA	-	0,7706*** (0,004)	0,0097 (0,007)	0,7348*** (0,200)	- (0,164)	0,0123* (0,007)	0,4689*** (0,067)	0.39
TPEIR	-	0,7336*** (0,004)	0,0044 (0,007)	0,8888*** (0,151)	-0,1998 (0,135)	0,0012 (0,006)	0,3971*** (0,051)	0.37
TEMP	-	1,1774*** (0,003)	-0,0059 (0,008)	1,4020*** (0,114)	0,0005 (0,123)	0,0107 (0,009)	0,1806*** (0,055)	0.31

Note: 5% Quantile Regression with Huber Sandwich method for computing the covariance matrix, Kernel (residual) for Sparsity estimation, Hall-Sheather Bandwidth method, Rankit (Cleveland) method for computing empirical quantiles and Epanechnikov kernel function. Pseudo  $R^2$  represents Koenker and Machado (1999) goodness-of-fit measure.

\*\*\* significant at 1% level, \*\*significant at 5% level, \* significant at 10% level.

Standard error in (). (-1) denotes one week lag.

The estimated values of the CoVaR indicators for the system at the 95% and 99% confidence level are graphically presented in Appendix 2 for each bank. A comparison of the average maximum possible losses at the 95% level during 2008-2010 shows that they range between 6%-10% of the total marked valued assets, as can be seen in Figure 2. The systemic risk conditioned on the individual risk level of Alpha Bank is the highest, followed by Unicredit Group, Commerz Bank and Dexia Group. At the 1% significance level the average CoVaR ranges between 10%-17% of the total marked valued assets.



**Figure 2** 5% Conditional Value at Risk during 01.01.2001 – 31.12.2010

Note: The table reports the average Conditional Value at Risk indicators for each bank during 15.09.2008 – 31.12.2010. The estimations are run using the 5% Quantile Regression method.

Table 8 synthetically presents the mean, t median and standard deviation of the weekly VaR and CoVaR values for the entire system analyzed during three periods. In the crisis sample the tails risk measures register the highest values.  $\text{CoVaR}_{1\%}^{\text{sys}}$  indicates a maximum possible loss of 17% of the market valued total assets, while its value in the pre-crisis sample is 14%. Also, if in the pre-crisis sample the  $\text{VaR}_{1\%}$  is a little above  $\text{CoVaR}_{1\%}$ , in the crisis sample CoVaR clearly dominates VaR at both confidence levels. These suggest the dynamic nature of the tail risk measures which are higher during stressed periods.

**Table 8** Value at Risk and Conditional Value at Risk of the system

<b>Entire period: 01.01.2001-31.12.2010</b>				
<b>Risk measure</b>	<b>Mean</b>	<b>Median</b>	<b>St. dev.</b>	<b>Observations</b>
$\text{VaR}^{\text{sys}}(1\%)$	-0.150	-0.142	-0.150	10.195
$\text{VaR}^{\text{sys}}(5\%)$	-0.082	-0.075	-0.082	10.195
$\text{CoVaR}^{\text{sys}}(1\%)$	-0.148	-0.148	-0.148	10.195
$\text{CoVaR}^{\text{sys}}(5\%)$	-0.084	-0.076	-0.084	10.195
<b>Pre-crisis period: 01.01.2001-15.09.2008</b>				
<b>Risk measure</b>	<b>Mean</b>	<b>Median</b>	<b>St. dev.</b>	<b>Observations</b>
$\text{VaR}^{\text{sys}}(1\%)$	-0.144	-0.137	0.039	7.795
$\text{VaR}^{\text{sys}}(5\%)$	-0.078	-0.074	0.025	7.795
$\text{CoVaR}^{\text{sys}}(1\%)$	-0.141	-0.134	0.036	7.795
$\text{CoVaR}^{\text{sys}}(5\%)$	-0.079	-0.074	0.025	7.795

<b>Crisis period: 15.09.2008-31.12.2010</b>				
<b>Risk measure</b>	<b>Mean</b>	<b>Median</b>	<b>St. dev.</b>	<b>Observations</b>
VaR <sup>sys</sup> (1%)	-0.170	-0.151	0.074	2.400
VaR <sup>sys</sup> (5%)	-0.096	-0.081	0.053	2.400
CoVaR <sup>sys</sup> (1%)	-0.174	-0.153	0.074	2.400
CoVaR <sup>sys</sup> (5%)	-0.101	-0.085	0.054	2.400

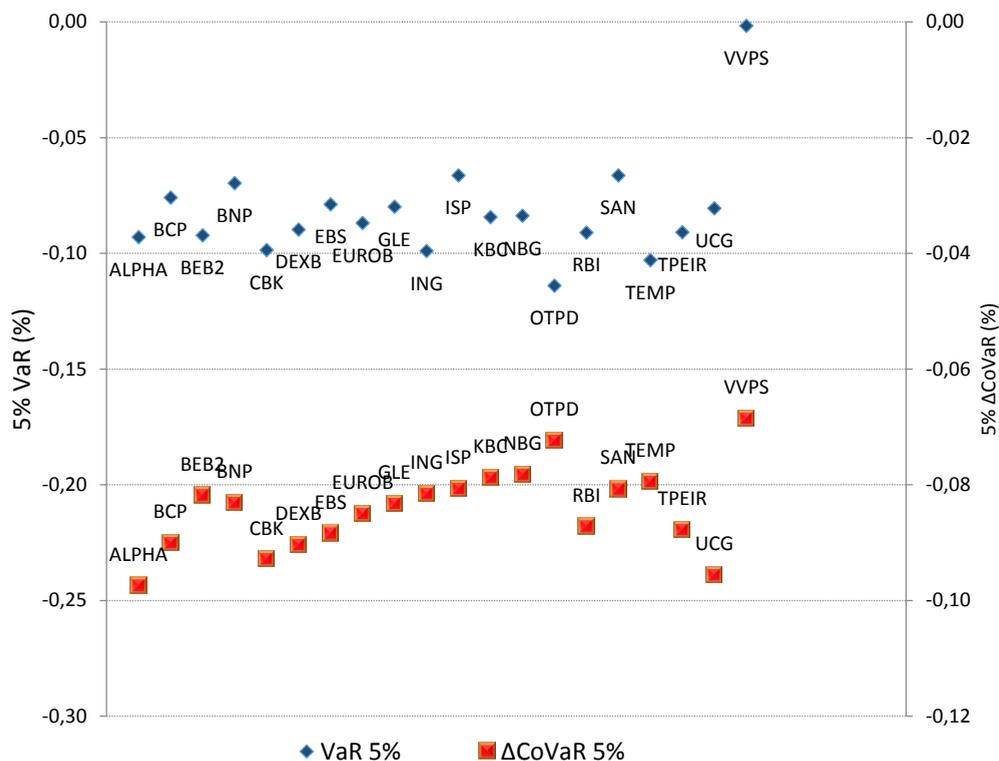
Note: The table reports the descriptive statistics of the average system's Value at Risk and Conditional Value at Risk indicators during 15.09.2008 – 31.12.2010. The estimations are run using the 5% Quantile Regression method.

#### **4.4 Individual contributions of banks to systemic risk**

Figure 3 illustrates each bank's average contribution to systemic risk over the 2008-2010 period. This is determined as the difference between system's VaR conditioned on the banks' assets growth rates in stressed conditions (for the 5% quantile) and system's VaR conditioned on the banks' assets growth rates in normal conditions (for the median of the distribution).

At 95% confidence level the most important contributions to systemic risk are given by Alpha Bank Greece, Unicredit Group Italy and Commerz Bank Germany followed by Dexia Bank Belgium and Millenium BCP Spain, which contribute on average with 9% to the maximum possible market valued assets losses of the entire system. At the 99% confidence level the situation changes, highlighting the importance of choosing an appropriate relevance level when using tail risk measures. The banks' contributions to systemic risk range between 10%-17%. The first places are occupied by two Greek banks, followed by France, Italian and German banks, as reported in Table 9.

The systemic risk conditioned on the event that each bank would register the maximum possible loss of its market valued total assets at a given confidence level is not proportional with its VaR. Even if a bank has the highest maximum possible loss of the market valued total assets, its contribution to systemic risk could be reduced if its correlation with the evolution of the whole banking system's market valued assets is insignificant, or vice versa if it register low losses but the correlation with the system is considerable.



**Figure 3** VaR and Contribution to systemic risk

Note: The table reports the VaR and Contribution to systemic risk ( $\Delta\text{CoVaR}$ ) indicators averaged for each bank during 01.01.2001 – 31.12.2010. VaR corresponds to the left scale, while  $\Delta\text{CoVaR}$  corresponds to the right scale.

Overall, the risk of a bank can't be treated in isolation, due to the strong interconnections with the system and to the likelihood of amplifying the negative impulses received from other banks or from the international markets.

**Table 9** Banks' ranking by  $\Delta\text{CoVaR}_{1\%}$  and  $\Delta\text{CoVaR}_{5\%}$

Rank	Bank	Headquarter	$\Delta\text{CoVaR}_{1\%}$	$\text{VaR}_{1\%}$	Rank	Bank	Headquarter	$\Delta\text{CoVaR}_{5\%}$	$\text{VaR}_{5\%}$
1	NBG	Greece	-0.169	-0.148	1	ALPH	Greece	-0.097	-0.093
2	TPEIR	Greece	-0.165	-0.152	2	UCG	Italy	-0.096	-0.081
3	BNP	France	-0.164	-0.141	3	CBK	Germany	-0.093	-0.099
4	UCG	Italy	-0.163	-0.147	4	DEXB	Belgium	-0.090	-0.090
5	CBK	Germany	-0.161	-0.165	5	BCP	Spain	-0.090	-0.076
6	EURO	Greece	-0.156	-0.143	6	EBS	Austria	-0.088	-0.079

Rank	Bank	Headquarter	$\Delta\text{CoVaR}$	VaR	Rank	Bank	Headquarter	$\Delta\text{CoVaR}$	VaR <sub>5</sub>
			1%	1%				5%	%
7	BCP	Spain	-0.155	-0.120	7	TPEIR	Greece	-0.088	-0.091
8	TEMP	Greece	-0.152	-0.285	8	RBI	Austria	-0.087	-0.091
9	ING	Holland	-0.151	-0.208	9	EURO	Greece	-0.085	-0.087
10	BEB2	Germany	-0.150	-0.141	10	GLE	France	-0.083	-0.080
11	DEXB	Belgium	-0.149	-0.143	11	BNP	France	-0.083	-0.070
12	ALPH	Greece	-0.148	-0.135	12	BEB2	Germany	-0.082	-0.092
13	RBI	Austria	-0.142	-0.140	13	ING	Holland	-0.082	-0.099
14	ISP	Italy	-0.133	-0.114	14	SAN	Spain	-0.081	-0.066
15	SAN	Spain	-0.133	-0.114	15	ISP	Italy	-0.081	-0.066
16	GLE	France	-0.131	-0.123	16	TEMP	Greece	-0.079	-0.103
17	KBC	Belgium	-0.123	-0.147	17	KBC	Germany	-0.079	-0.084
18	EBS	Austria	-0.123	-0.106	18	NBG	Greece	-0.078	-0.084
19	VVPS	Austria	-0.109	-0.013	19	OTPD	Hungary	-0.072	-0.114
20	OTPD	Hungary	-0.104	-0.197	20	VVPS	Austria	-0.069	-0.002

Note: The table reports each bank's the individual risk (VaR) and Contribution to systemic risk ( $\Delta\text{CoVaR}$ ) indicators averaged during 01.01.2001 – 31.12.2010.

## 5 CONCLUSIONS

An investigation of contagion spillovers among western European mother banks with subsidiaries in CEE is of crucial importance at this moment due to the high interconnectivity. This could increase the vulnerability to international financial markets during stressed periods. In most cases, the problems encountered by mother banks due to high exposures on the European financial markets require an adequate recapitalization proportional with the level of losses caused by the deteriorating quality and market value of assets.

In order to analyze these problems we focused on a group of 20 Euro zone banks that own more than 90% of the CEE banking system, during the 01.01.2001 – 31.12.2010 period. The estimation of systemic risk was made through several tail risk measures like Value at Risk and Conditional Value at Risk of the system. These were calculated for the weekly market valued total assets growth rates of each bank using quantile regression. The results of this paper indicate that the tail risk measures are influenced by the European capital, governmental bonds and

interbank money markets. They are time varying, being higher and more volatile after the 2008 financial crisis.

The choice of an appropriate confidence level is very important due to the fact that it generates different estimates of the risk measures depending on restrictive extreme values distributions. At the 99% confidence level the banks' contributions to systemic risk range between 10% and 17% loss form the market valued total assets. The first places are occupied by two Greek banks, followed by France, Italian and German banks. At a 95% confidence level the banks' contributions to systemic risk range between 6%-10%. This first place is still occupied by a Greek bank, followed by an Italian bank and by a German one.

From prudential supervision perspectives the control of systemic risk can be done through imposing limits to the banks'  $\Delta\text{CoVaR}$  values. First, the CoVaR measure is superior to VaR, because the conditioning of the system's most negative assets growth rates on each bank's negative extreme values captures better the systemic risk. Second, using the quantile regression technique presents the advantage of a more robust distribution's tail estimation when dealing with extreme values. We leave for future research the countercyclical adjustments of the assets and liabilities portfolios that could be made in order to reduce the banks' contribution to systemic risk.

In terms of policy implications, the findings of the paper provide important information for banks in reevaluating their internal control systems, for investors whose decisions to hold a given bank stock is made upon its maximum expected loss and especially for policy makers in designing a supervision regulatory framework specific to banks with cross-border activities in CEE.

#### ACKNOWLEDGMENTS

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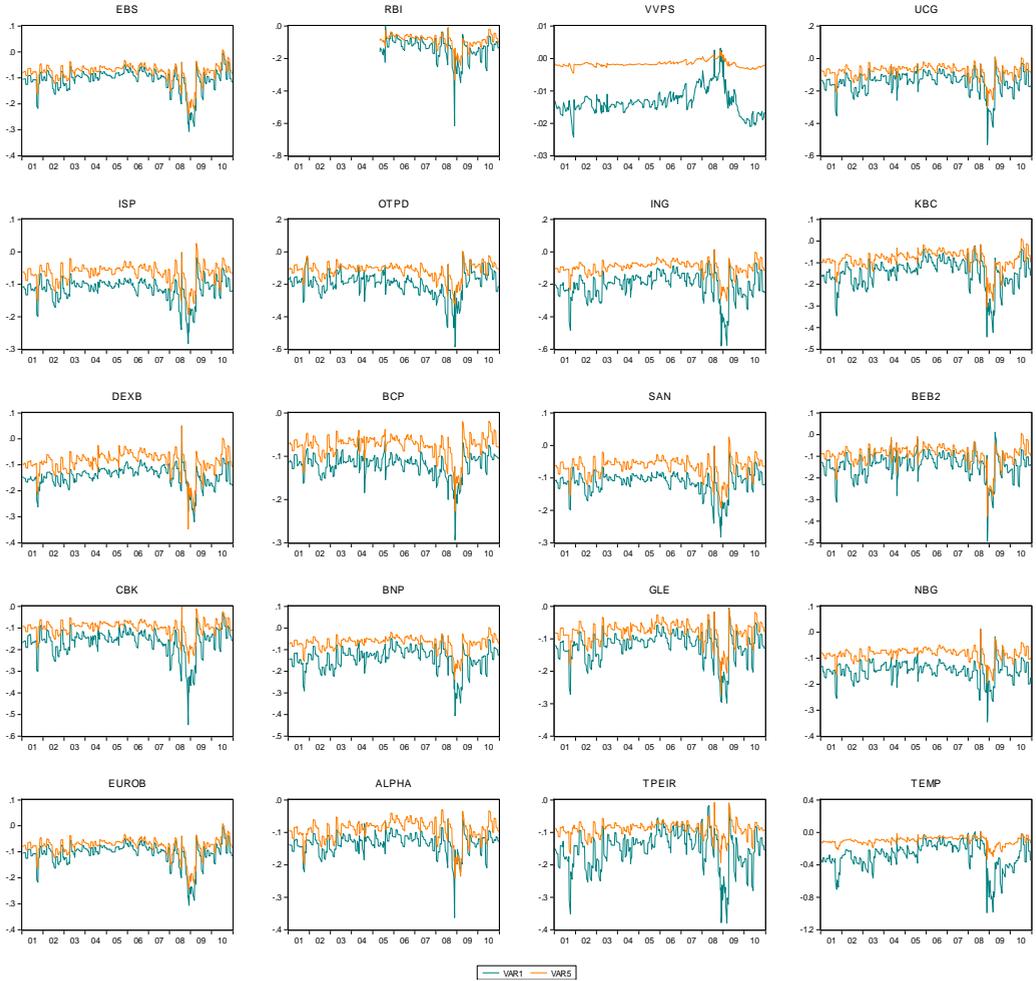
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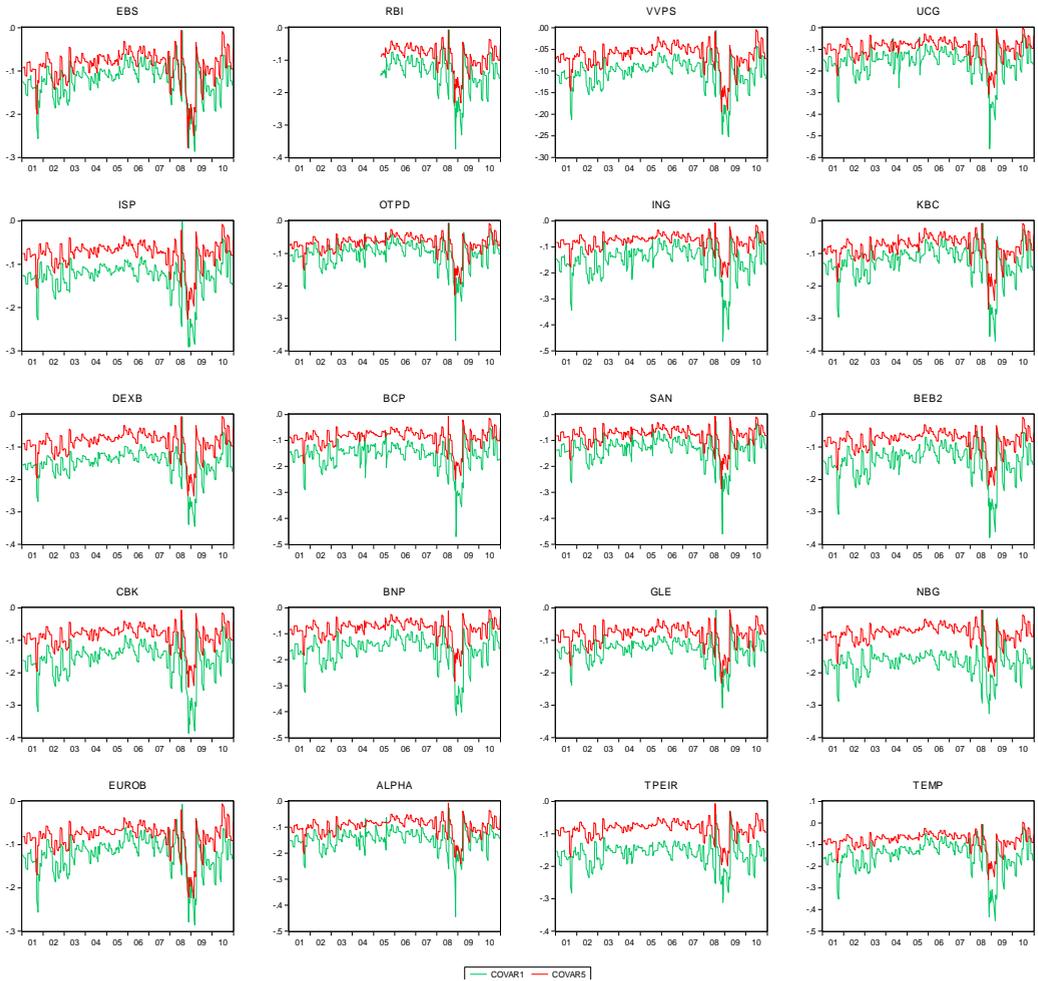
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**APPENDIX**

**Appendix 1** The evolution of 1% VaR and 5% VaR during 01.01.2001 – 31.12.2010



### Appendix 2 The evolution of 1% CoVaR and 5% CoVaR during 01.01.2001 – 31.12.2010





## ASPECTS REGARDING THE EVOLUTION OF NOMINAL AND REAL CONVERGENCE BEFORE AND AFTER ADHESION TO EURO ZONE

Lucian Claudiu ANGHEL\*, Florina PÎNZARU\*\*, Mihaela DINU\*\*\*

**Abstract:** *This paper presents the analysis of some aspects of nominal and real convergence for 6 countries having adhered to the euro zone until 2013; it is an in-depth analysis of inflation, together with the main components of the consumption basket in the candidate countries.*

*The article will analyse economic competitiveness of Slovenia, Greece, Malta, Cyprus, Estonia and Slovakia, since the admission to the euro zone implies giving up the exchange rate policy independence, with an impact on the possibility of further support for price competitiveness. The analysis of competitiveness before adopting the euro (in the framework of the Exchange Rate Mechanism II) will be made based on the market share within the European Union and on the effective real exchange rate. It is important to find out whether admission to the euro zone automatically brings an increase of exports competitiveness and an increasing market share within the euro zone for the member states.*

*Competitiveness through the real effective exchange rate will be analysed through consumer prices indexes, the unit cost of work and export prices.*

*The analysis underlines important aspects to be taken into account by every country that could adhere to the euro zone. The choice of the moment for the entry into ERM II is crucial for future candidates to the euro zone, as forcing an early entry could negatively influence their long term economic evolution.*

**Keywords:** *nominal convergence, real convergence, effective real exchange rate, market share, price competitiveness*

**JEL Classification:** F33

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## 1. INTRODUCTION

This paper intends to present the analysis of some aspects of nominal and real convergence for 6 countries having adhered to the euro zone before 2013: Greece (joined ERM II in 1999 and adopted the euro in 2001), Slovenia (entered the ERM II in 2004 and the Euro zone in 2007), Cyprus and Malta (joined ERM II in 2005 and then entered the Euro zone in 2008), Slovakia (joined ERM II in 2005 and entered the Euro zone in 2009) and Estonia (entered the ERM II in 2004 and joined Euro zone in 2011).

Analysis could underline important aspects to be taken into account by every country that could adhere to the euro zone. Thus, the choice of the moment for the entry into ERM II is crucial for future candidates, as forcing an early entry could negatively influence their long term economic evolution.

## 2. ASPECTS REGARDING THE EVOLUTION OF NOMINAL AND REAL CONVERGENCE WITHIN THE EXCHANGE RATE MECHANISM II AND AFTER ADHESION TO THE EURO ZONE

An important analysis refers to the evolution of nominal and real convergence of candidate states, but also to their competitiveness after adhesion to the Exchange Rate Mechanism II (ERM II) and to the euro zone. We will further present a series of indexes, relevant from this standpoint for several countries having adopted the unique European currency previous to 2013 in comparison with the Euro zone as a whole. The analysis will take into consideration Greece, Slovenia, Cyprus and Malta, Slovakia and Estonia.

First, we will analyse the way the candidate states have complied to the nominal convergence criteria regarding price stability. These criteria will be analysed for a long period before adhesion to ERM II. Table 1 illustrates the evolution of average annual inflation in Greece, Cyprus, Malta, Slovakia, Slovenia, and Estonia compared the euro zone between 2000 and 2011.

*Table 1* Evolution of average annual inflation- difference from the values registered in the euro zone (percentage points)

	Estonia	Greece	Cyprus	Malta	Slovenia	Slovakia
2000	1,7	0,7	2,7	0,8	6,7	10,0
2001	3,2	1,3	-0,4	0,1	6,2	4,8
2002	1,3	1,6	0,5	0,3	5,2	1,2

	<b>Estonia</b>	<b>Greece</b>	<b>Cyprus</b>	<b>Malta</b>	<b>Slovenia</b>	<b>Slovakia</b>
2003	-0,7	1,3	1,9	-0,2	3,6	6,3
2004	0,8	0,8	-0,3	0,5	1,5	5,3
2005	1,9	1,3	-0,2	0,3	0,3	0,6
2006	2,2	1,1	0,0	0,4	0,3	2,1
2007	4,6	0,9	0,1	-1,4	1,7	-0,2
2008	7,3	0,9	1,1	1,4	2,2	0,6
2009	-0,1	1,0	-0,1	1,5	0,6	0,6
2010	1,1	3,1	1,0	0,4	0,5	-0,9
2011	2,4	0,4	0,8	-0,2	-0,6	1,4
<b>Average</b>	<b>2,1</b>	<b>1,2</b>	<b>0,6</b>	<b>0,3</b>	<b>2,4</b>	<b>2,7</b>

Source: Eurostat, Anghel L.C., Ciurila N., Bojesteau E., 2012

After adhesion to ERM II, most of the candidate states have had annual average inflation rates beyond the one in the euro zone, except for Cyprus and Malta that registered inflation rates fluctuating around the Eurozone level almost all the long of the time horizon taken into consideration (2000-2011).

Within the structure of consumer prices, we have searched for those product groups that have aligned more difficultly to the Eurozone dynamics. Table 2 below shows price dynamics for industrial non-energetic products addressed to households' consumption and energy prices.

**Table 2** Average annual variation for non-energetic industrial products and energy prices- difference from the values in the euro zone (%)

	<i>Non-energetic industrial products</i>						<i>Energy prices</i>					
	<b>EST</b>	<b>GR</b>	<b>CY</b>	<b>M</b>	<b>SLO</b>	<b>SK</b>	<b>EST</b>	<b>GR</b>	<b>CY</b>	<b>M</b>	<b>SLO</b>	<b>SK</b>
2000	0,8	0,1	1,2	-1,1	-	4,5	-	3,9	9,6	-2,5	-	29,7
2001	2,4	1,9	-2,3	-0,8	3,9	0,7	-	-4,1	-0,5	-2,1	11,0	10,0
2002	0,7	1,0	-2,4	-1,1	3,4	0,5	7,2	0,2	7,4	4,2	5,2	1,9
2003	-0,5	0,8	-1,5	-2,1	4,0	2,7	-0,6	0,5	9,1	-1,0	0,2	16,0
2004	-1,3	1,6	-3,8	0,8	1,0	1,0	3,8	1,8	6,7	1,3	2,4	9,9
2005	-0,1	2,5	-1,4	1,1	-0,6	-0,8	3,5	3,5	2,8	5,8	1,8	-1,9
2006	1,3	1,0	-2,4	0,6	-1,5	0,0	0,5	1,7	1,1	9,3	0,7	5,3
2007	1,6	1,2	-2,1	-0,6	-0,7	-2,1	5,4	-0,5	-0,6	-7,8	0,8	-1,3
2008	1,6	1,2	-0,7	1,2	1,4	-0,4	13,5	3,5	3,6	4,2	-0,9	-5,8
2009	-0,1	0,2	-0,8	-0,9	-0,6	-1,9	4,5	-4,1	-7,7	5,8	3,5	8,3
2010	0,2	1,4	-0,5	-0,7	-2,7	-1,9	4,0	23,0	12,2	11,2	6,5	-8,7
2011	0,8	-0,9	0,4	0,1	-1,7	-0,5	-3,4	4,8	6,2	-0,1	-3,1	-1,4
<b>AV</b>	<b>0,6</b>	<b>1,0</b>	<b>-1,4</b>	<b>-0,3</b>	<b>0,5</b>	<b>0,2</b>	<b>3,8</b>	<b>2,9</b>	<b>4,2</b>	<b>2,4</b>	<b>2,6</b>	<b>5,2</b>

Source: Eurostat, Anghel L.C., Ciurila N., Bojesteau E., 2012

It can be noticed that Greece has registered an upper evolution of industrial non-energetic products (which can be considered as trables) in comparison with the Eurozone. A similar evolution can be noticed in Estonia, but only within the period 2006-2008 assimilated to the economic boom. The other countries have had variations in line with those in the Eurozone and Cyprus had even registered sustained price decreases.

Evolution of energy prices is strongly correlated in the analyzed countries, except for Slovakia, and we can notice, on average, a significant upper evolution of energy prices compared to the Euro zone.

The degree of correlation is also high when analyzing prices of food goods and non-alcoholic beverages (Table 3). Only Estonia- for the period of 2004-2011 - and Cyprus and Slovenia - for almost all the time laps taken into consideration- have registered variations of more than 1,5 percentage points from the levels registered in the Euro zone.

**Table 3** Average annual variation of food goods and alcoholic beverages- difference from the values in the Euro zone (%)

	<b>EST</b>	<b>GR</b>	<b>CY</b>	<b>M</b>	<b>SLO</b>	<b>SK</b>
2000	1,1	0,8	4,2	1,3	-	4,4
2001	2,2	1,2	-0,4	-0,3	4,3	0,7
2002	-0,4	3,0	3,4	0,5	5,6	0,0
2003	-3,5	1,9	4,3	-1,0	3,2	2,4
2004	1,3	-0,8	2,1	0,1	-1,1	3,4
2005	2,3	-0,4	0,6	0,2	-1,3	-2,2
2006	2,0	1,6	2,4	-0,6	0,3	-0,1
2007	4,9	0,2	1,4	0,3	4,2	1,2
2008	9,4	-0,5	0,0	1,5	3,0	1,3
2009	-0,3	1,8	3,2	5,1	1,1	-1,6
2010	2,3	2,0	-0,4	0,6	1,4	1,8
2011	5,9	1,5	2,4	2,0	2,1	2,8
<b>Average</b>	<b>2,3</b>	<b>1,0</b>	<b>1,9</b>	<b>0,8</b>	<b>2,1</b>	<b>1,2</b>

Source: Eurostat, Anghel L.C., Ciurila N., Bojesteanu E., 2012

Services price increases, the non-tradable category, have been beyond those in the Euro zone in most cases, reflecting a Balassa-Samuelson type effect (Balassa, 1964), as illustrated by Table 4. Difference was significant in Slovakia for all the period and in Slovenia (Zumer, 2002) and Estonia until 2009.

**Table 4.** Average annual variation of services tariffs and administered prices - difference from the values registered in the Euro zone (%)

	Services tariffs						Administered prices					
	EST	GR	CY	M	SLO	SK	EST	GR	CY	M	SLO	SK
2000	6,0	1,1	1,9	3,7	-	11,8	11,4	0,3	1,1	0,6	5,2	2,5
2001	3,2	1,4	1,5	1,2	7,8	10,0	0,8	0,3	2,4	-1,3	3,5	19,8
2002	1,4	1,3	-0,3	0,4	7,0	3,5	0,4	-1,3	-4,8	-1,4	2,4	13,4
2003	1,7	1,6	1,9	2,0	4,5	7,8	3,8	1,2	1,6	12,7	1,2	6,9
2004	0,7	1,2	-0,1	0,7	3,2	7,4	3,6	0,8	3,0	11,9	-0,1	9,5
2005	1,4	1,3	-0,2	0,0	1,0	3,0	7,0	1,0	0,5	-5,4	0,8	-0,1
2006	3,2	1,1	-0,1	0,2	1,5	1,5	19,2	-0,2	6,0	8,6	0,5	2,6
2007	7,1	1,2	1,0	-2,0	2,4	0,4	7,5	2,0	-3,6	14,5	0,1	3,3
2008	7,5	1,2	1,8	1,8	2,7	2,2	4,1	2,0	5,6	10,8	5,1	-1,7
2009	-0,7	1,2	1,4	-0,1	1,2	2,4	0,9	-0,8	0,9	0,2	-2,6	3,4
2010	-1,2	1,7	-0,7	0,0	-0,2	0,5	<b>5,9</b>	<b>0,5</b>	<b>1,3</b>	<b>5,1</b>	<b>1,6</b>	<b>6,0</b>
2011	1,4	0,1	-0,7	-0,6	-1,8	1,7	11,4	0,3	1,1	0,6	5,2	2,5
Average	<b>2,6</b>	<b>1,2</b>	<b>0,6</b>	<b>0,6</b>	<b>2,7</b>	<b>4,4</b>	<b>5,9</b>	<b>0,5</b>	<b>1,3</b>	<b>5,1</b>	<b>1,6</b>	<b>6,0</b>

Source: Eurostat, Anghel L.C., Ciurila N., Bojesteau E., 2012

Probably, an important part of the significantly increased variation of services tariffs from the Eurozone level comes from a series of goods with administered prices included in the services category (Dumitru, 2008). Besides, the evolution of administered prices in the 6 countries is un-correlated, as Table 4 shows. On the one hand, we can observe that Estonia and Slovakia had big administered price increases and, for certain years, even Malta registered the same phenomena. On the other hand, we can observe excessive volatility of their dynamics in Cyprus (Egert *et al.*, 2002).

Table 5 illustrates a summary of average annual variations of all price categories discussed above, underlining differences of more than 1,5% from the Eurozone. From this table, it can be noticed that only Estonia, Slovenia and Slovakia have registered such superior differences, when taking into consideration the whole price consumer basket. As for energy products, all the 6 states present significantly upper price evolutions to the ones in the Eurozone.

**Table 5** Average annual variation of different prices categories from the Eurozone (percentage points)

	EST	GR	CY	M	SLO	SK
Industrial non-energy goods	0,6	1,0	-1,4	-0,3	0,5	0,2
Energy	<b>3,8</b>	<b>2,9</b>	<b>4,2</b>	<b>2,4</b>	<b>2,6</b>	<b>5,2</b>
Food goods	<b>2,3</b>	1,0	<b>1,9</b>	0,8	<b>2,1</b>	1,2
Services	<b>2,6</b>	1,2	0,6	0,6	<b>2,7</b>	<b>4,4</b>

	EST	GR	CY	M	SLO	SK
Administered prices	5,9	0,5	1,3	5,1	1,6	6,0
Total	2,1	1,2	0,6	0,3	2,4	2,7

Source: Eurostat, Anghel L.C., Ciurila N., Bojesteanu E., 2012

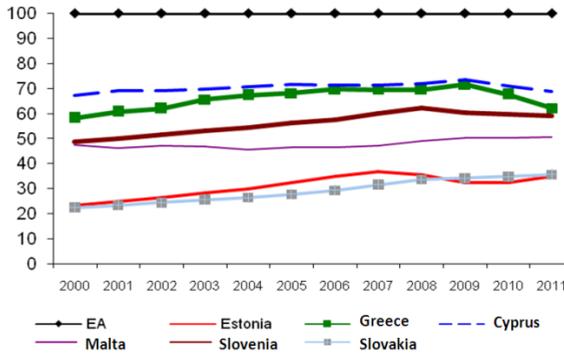


Figure 1 Evolution of GDP per capita relative to the Eurozone

Source: Eurostat, Anghel L.C., Ciurila N., Bojesteanu E., 2012

When looking at the real convergence, the 6 countries have had different evolutions starting from different levels, as shown by Figure 1. On the one hand, starting with a GDP per capita under the level of the Eurozone, Slovakia has continued its real convergence after adoption of the euro in 2009. On the other hand, Greece, Slovenia and Cyprus have registered decreasing GDP per capita compared to the Eurozone, under the influence of the financial and economic crisis starting in 2007, while Malta has not for a moment recovered the economic discrepancy from the Eurozone (Bojesteanu, 2012).

### 3. EVOLUTION OF COMPETITIVENESS THROUGH EFFECTIVE REAL EXCHANGE RATE AND MARKET SHARE IN THE ERM II AND AFTER ADHESION TO THE EURO ZONE

We will considerate competitiveness of countries previously analysed through two indexes: market share and real effective exchange rate (REER).

The market share has been computed by dividing the exports of each country analysed by the total imports of the European Union (Bojesteanu, 2010). Looking at the evolutions of market shares starting with 2000 (Table 6), we can observe marginal modification after adhesion to the Eurozone. Slovakia has significantly increased its market share in the EU after this moment, but, as the same tendency

was visible since 2000, it is not linked to the adoption of the euro (Bulir, Smidkova, 2005). It is important to underline that Slovakian exports have been extremely dynamic despite a significant appreciation of the real exchange rate, as illustrated in Figure 8. One explanation for this evolution could be given by the big foreign direct investments (FDI) inflows providing sales markets for this country of 5 million inhabitants (Benkovskis, Wortz, 2012). Obviously, FDI inflows in Slovakia have been based more on the export potential rather than on internal consumption (Allard, 2009).

Market share increases after adhesion to the Eurozone have been registered only in Slovakia and Estonia, while insignificant changes were observed for the case of Greece, Malta and Cyprus.

**Table 6** Market share in the European Union

	<b>EST</b>	<b>GR</b>	<b>CY</b>	<b>M</b>	<b>SLO</b>	<b>SK</b>
2000	0,26	0,04	0,04	0,40	0,13	0,26
2001	0,28	0,05	0,04	0,45	0,12	0,27
2002	0,28	0,04	0,03	0,51	0,13	0,29
2003	0,31	0,04	0,04	0,62	0,13	0,31
2004	0,28	0,04	0,04	0,62	0,14	0,30
2005	0,27	0,04	0,04	0,61	0,15	0,28
2006	0,28	0,04	0,09	0,67	0,15	0,28
2007	0,29	0,03	0,06	0,81	0,14	0,32
2008	0,27	0,04	0,05	0,84	0,13	0,32
2009	0,28	0,04	0,04	0,92	0,13	0,32
2010	0,27	0,04	0,05	0,96	0,14	0,33
2011	0,27	0,04	0,05	1,00	0,17	0,34

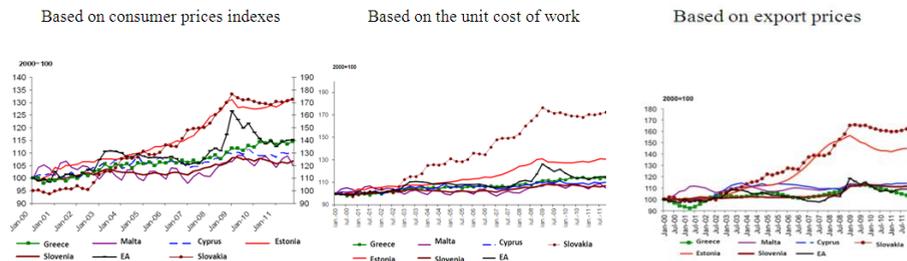
Source: Eurostat, Anghel L.C., Ciurila N., Bojesteau E., 2012

We have also to underline that all these countries are relatively small when related to the EU level and their market share has not dramatically changed after adopting the euro currency, except for Slovakia (Isărescu, 2008). Therefore, their dependency on Eurozone evolutions is reinforced. Without any exception, the slight market share increase of these 6 countries, when comparing 2011 with 2000, can be considered as a positive sign, yet it cannot be exclusively linked to the adhesion to the Eurozone, since the impact on the market share is marginal.

The real effective exchange rate can be computed using several price differentials: consumer prices, export prices, GDP deflator or the unit cost of work (Altăr *et al.*, 2009). As shown by the graphs bellow, the evaluations of

competitiveness through prices based on the real effective exchange rate, using 36 commercial partners, will be mostly similar, regardless of the price differentiator used for the computation (Lee *et al.*, 2008).

When analysing the real effective exchange rate computed based upon the *harmonized consumer price indexes* (Figure 2), we can notice that the biggest damage on price competitiveness was registered in Slovakia, where the real exchange rate has been continuously increasing since 2000 and up to 2011. The same evaluation is applicable to Estonia, although its real exchange rate has increased less than in the case of Slovakia. Slovenia and Malta are the countries which best preserved their price competitiveness, while the real exchange rate of Cyprus and Greece has followed the same evolution as the Eurozone as a whole.



**Figure 2** Evolution of the real effective exchange rate with 36 commercial partners (2000=100)

Source: Eurostat, Anghel L.C., Ciurila N., Bojesteau E., 2012

The real effective exchange rate computed based upon the *unit cost of work* within the economy shows the highest worsening for Slovakia and Estonia, even if differences are lower than when using consumer prices. Furthermore, Slovenia is the country which best preserved its price competitiveness, but the difference from Greece is less significant.

Differences between countries look clearer when analysing the effective real exchange rate based upon *export prices* (Figure 2). While the real exchange rate increase in Q4 2011 was 7% compared to Q1 2000 in the case of Slovenia, Slovakia registered an increase of 35% for the same period taken into consideration. Cyprus had a similar evolution to the one of the Eurozone as a whole, while Malta and Greece have had moderate competitiveness losses.

#### 4. CONCLUSIONS

For Estonia, Slovenia, Greece, Malta, Cyprus and Slovakia, the analysis of 12 years statistical data (2000-2011) underlines an upper average annual variation for some price categories than in the Euro zone, especially for energy goods and services.

The highest differences from the Euro zone could be noticed for the administered prices in some countries– Estonia (5,9%), Malta (5,1%) and Slovakia (6%)- underlining not enough structural reform on the long run. Inflation is the most important index analysed by the ECB in the process of accepting new members in the Euro zone and price stability is its objective.

The bigger are the countries, the bigger are the variations in inflation compared to the Euro zone. For instance, only Cyprus and Malta have managed to register average variations in inflation-bellow 1 percentage point- compared to the Euro zone between 2000 and 2011, while Slovakia did the opposite, with a variation of 2,7 percentage points. This fact could be an additional element to be analysed by the ECB when Poland and Romania will adhere to the Euro zone, as these 2 countries are a few time bigger than the recently accepted states that complied with the nominal and real convergence tests (Codirlaşu, Chideşciuc, 2004).

Another relevant aspect is the evolution of price competitiveness of countries (analysed through market share and real effective exchange rate) before and after adhesion to the Euro zone. With one exception- Slovakia-all countries have has an important increase of their market share in the EU after adhesion to the Euro zone. However, even if all countries have registered a very small increase (comparing 2011 to 2000) in their market share, this could not be the effect of their euro adoption. Therefore, nominal evolution will highly depend upon the EU evolution as a whole. Every increase or decrease of commercial volumes will be directly reflected in the macroeconomic evolutions of these indicators for the 6 countries analysed.

As for Slovakia, the high increase of its market share by approximately 0,6 percentage points could be explained by the massive foreign direct investments inflows bringing along sales markets for the products manufactured in Slovakia, destined to the communitarian space and using a cheaper work force- compared to the more developed countries. This phenomenon has brought along a recovery in the gap between the Slovakian GDP per capita and the one of the Euro zone and a

consistent loss in price competitiveness through the unit cost of work, consumer prices and export prices.

A similar tendency, although to a lower extent, is noticed in Estonia and it underlines that countries adhering to the Euro zone have to be extremely well prepared before adhesion. Adopting the euro does not implicitly insure a competitiveness increase. Moreover, all the countries analysed in this paper are small, therefore it could be necessary to analyse more carefully this dimension when assessing the eventual adhesion of bigger countries such as Poland and Romania to the Euro zone.

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## THE MACROECONOMIC EFFECTS OF FISCAL POLICY. A BVAR APPROACH

Ioana BOICIUC\*

**Abstract:** *The interest on fiscal policy has been recently renewed due to the economic recession and given the limited scope of monetary policy to provide additional stimulus for the economy. Also the empirical studies on fiscal policy have not reached a consensus about the effects of fiscal shocks on macroeconomic variables.*

*This study seeks to analyze the effects of government expenditure and tax revenue shocks on economic activity by applying a BVAR methodology. The advantage of the Bayesian technique is that it allows prior information to be imposed on the system, in addition to that provided by data. This paper provides a detailed evaluation of the effects of fiscal policy in Romania, but also for the Eastern European Emerging Markets. Quarterly data for five variables are used in the estimation: GDP, inflation, interest rate, government expenditure and tax revenues. The main results show that the fiscal policy has a small effect on the considered variable.*

**Keywords:** *Fiscal Policy, Bayesian estimation, VAR model*

**JEL Classification:** *E62, H30*

### 1 INTRODUCTION

The interest for studying fiscal policy shocks has been renewed given the importance of fiscal policy in the economic recovery after the recent economic crisis. Even though the empirical literature on this topic is growing there is still a lack of consensus on either the qualitative or quantitative properties of the effects of fiscal policy shocks on the economic activity. The main focus in the research papers remains especially on the effects of fiscal policy shocks on GDP even if on talk about the fiscal stimulus to counteract the economic downturn or about the

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fiscal consolidation strategies. Different studies provide different results therefore the estimates of the size of the fiscal multipliers are dispersed over a wide range.

An approach commonly used to estimate the effects of fiscal policy shocks on economic activity is based on vector autoregressive (VAR) models. The empirical studies with VAR approach have different scheme of identification of the shocks the main ones being: the recursive approach, the event-study approach, the structural vector autoregressive (SVAR) approach introduced by Blanchard and Perotti (1999) and the sign-restrictions approach introduced by Mountford and Uhlig (2005). Besides these, other related approaches used to investigate the effects of fiscal policy are Bayesian VAR and time varying parameter VAR. The first one relies on Bayesian estimation that allows for prior information to be imposed on the system in addition to the information provided by the data. The second one, compared to the linear model, allows for fiscal policy shocks to vary over time according to the changes in the economic activity. In this study, a Bayesian approach will be considered to assess the effects of fiscal policy shocks on the economic activity.

According to investigation of the existing literature, the number of research papers regarding the impact of fiscal policy for emerging markets is limited compared to the literature for developed economies. The aim of this paper is to contribute to the analysis on the macroeconomic effects of fiscal policy in Eastern European Emerging Economies. A minimal set of endogenous variables (real GDP, inflation, interest rate, government spending and revenues) it is used to analyze empirical evidence from Romania, Bulgaria, Czech Republic and Hungary for the period 2000q1-2013q3. The use of quarterly fiscal data allows identifying more precisely the effects of fiscal policies.

The rest of the paper is structured as follows: the next section provides an overview of the related literature; section 3 briefly presents the methodology used for measuring the effects of fiscal policy and describes the data used in the empirical study, section 4 presents the results while section 5 presents the concluding remarks.

## **2 LITERATURE REVIEW**

In this section I present some recent evidence of the related publications regarding Bayesian estimation of fiscal VAR models.

Afonso and Sousa (2009) investigate the macroeconomic effects of fiscal policy using a Bayesian SVAR approach for the following economies: US, UK,

Germany and Italy. The paper provides a detailed evaluation of the effects of fiscal policy on economic activity: explicitly include the feedback from government debt in estimations, analyze the impact of fiscal policy on the composition of GDP (private investment and private consumption) and investigate how fiscal policy affects stock prices, housing prices and the growth rate of monetary aggregates. The main findings are that government spending shocks have a small effect on GDP, do not impact significantly on private consumption and impact negatively on private investment, have a varied effect on housing prices and a small and positive effect on the growth rate of monetary aggregates. Taking into account the feedback from government debt it is obtained a more persistent effect of fiscal policy on interest rate and GDP.

Michal Franta (2012) analyzes the macroeconomic effects of fiscal policy shocks in the Czech Republic by estimating a small-scale VAR model using Bayesian techniques. The paper provides a complex evaluation in terms of identification schemes of structural shocks of the model by employing, in this regard, three different methods: recursive identification, SVAR formulated in terms of the AB model and sign restrictions. The results obtained suggest that the fiscal policy transmission mechanism in the Czech Republic exhibits some standard features: an increase in output and inflation after a rise in government spending and an increase in government spending after a positive shock to government revenues.

Karagyozova (2013) provides a range of estimates for the fiscal multipliers in Bulgaria using linear VAR models with different identification schemes for fiscal shocks and time varying parameter VAR models. The second method is estimated by Bayesian technique. The main findings are that the effectiveness of fiscal policy in stimulating economic activity is generally low; the spending multipliers do not exceed 0.4 in line with most of the studies on the catching-up EU Member State; the underlying state of the economy appears to be a relevant factor for the nonlinear effects of fiscal policy.

### 3 METHODOLOGY AND DATA

The VAR (p) model can be written as:

$$y_t = a_0 + \sum_{j=1}^p A_j y_{t-j} + \varepsilon_t \quad (1)$$

where  $y_t$  for  $t = 1, \dots, T$ , is an  $M \times 1$  vector containing observations on variables,  $a_0$  is an  $M \times 1$  vector of intercepts  $A_j$  is a  $M \times M$  matrix of coefficients and  $\varepsilon_t$  is an  $M \times 1$  vector of errors. It is assumed  $\varepsilon_t$  to be i.i.d.  $N(0, \Sigma)$ . The VAR model can be rewrite in two alternative formats:

$$Y = XA + E \quad (2)$$

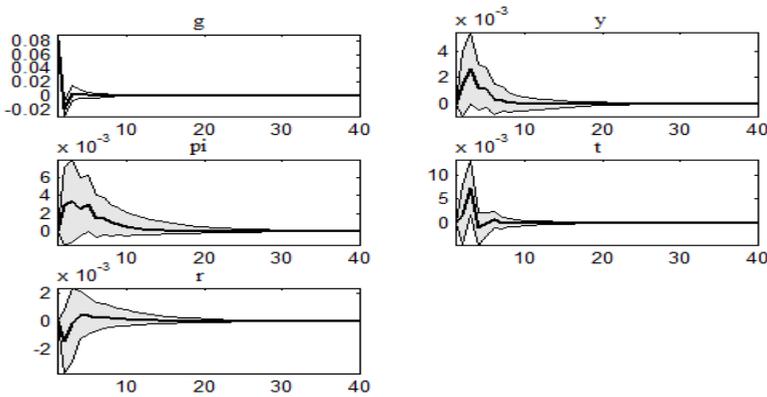
$$y = (I_M \otimes X)\alpha + \varepsilon, \quad \varepsilon \sim (0, \Sigma \otimes I_T) \quad (3)$$

where  $Y$  and  $E$  are  $T \times M$  matrices and  $X$  is a  $T \times k$  matrix ( $k$  -number of coefficients in each equation of the VAR),  $I_M$  is the identify matrix and  $\alpha = \text{vec}(A)$  is a  $Mk \times 1$  vector. The likelihood function can be derived from (3) and decomposed into the product of a one distribution for  $\alpha$  given  $\Sigma$  and another where  $\Sigma^{-1}$  has a Wishart distribution. Under appropriate conjugate prior restrictions, it can be derived the conditional posterior distribution for the VAR coefficients and the covariance matrix of the reduced form shocks. The prior distributions considerate in this paper are uninformative priors. Using additional prior information the VAR coefficients, impulse responses functions and forecasts can be more precisely estimated. The model above is estimated by Bayesian techniques, the fiscal shocks being identified using a recursive scheme (Cholesky decomposition).

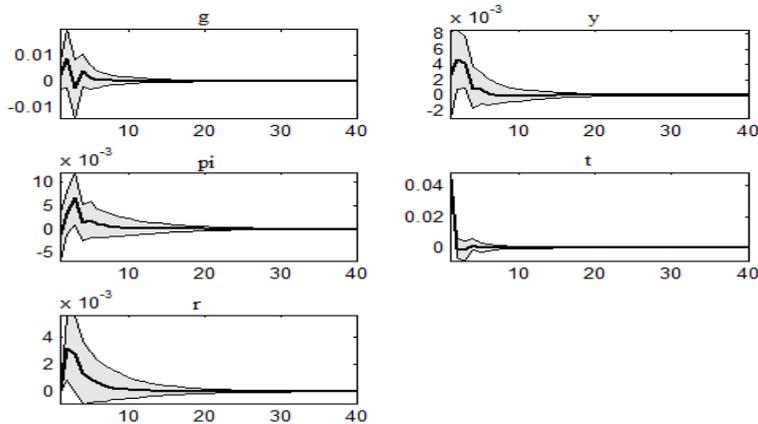
The choice of endogenous variables follows the empirical literature, thus the vector of endogenous variables consists of five standard variables commonly used to assess the effects of fiscal policy. The variables are government spending ( $g$ ), GDP ( $y$ ), inflation ( $\pi$ ), government revenues ( $t$ ), and the interest rate ( $r$ ), and are used in estimation like listed above. The data are seasonally adjusted with Tramo/Seats. Government spending and revenues and GDP are deflated by GDP deflator. The deflated series are then expressed in log. All the variables are used in first differences. As measurement for inflation it is used GDP deflator and for interest rates the 3- month money market interest rate. The source of data series is Eurostat.

## 4 RESULTS

The impulse response functions for the government spending shock and revenues shock in Romania are presented in the next two figures. The main interest is to analyze the impact of a government expenditure shock to endogenous variable, especially on real output.



*Figure. 1* Responses of variables after the Government Spending Shock in Romania



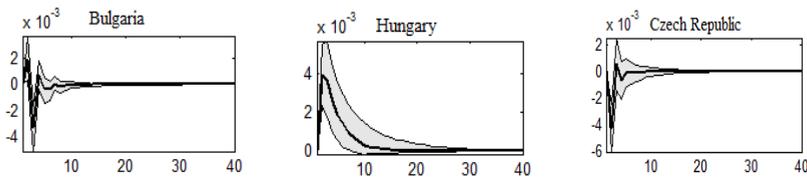
*Figure. 2* Responses of variables after the Government Revenues Shock in Romania

As it is shown in similar studies, the impact of a government spending shock for emergent economies is small. After positive government expenditure shock the real output rise but its intensity is reduced. The fiscal multiplier is very small, less than 1 if it were to compare with fiscal multipliers obtained in empirical studies, for developed economies. After the initial government expenditure the dynamic of the endogenous variables is consistent with the economic theory: inflation, tax revenues and interest rate increase in short-term, but the uncertainty regarding the magnitude of the increase is greater. The response of government spending after a positive shock of government spending is not persistent and the effect of the shock is almost zero from the second quarter.

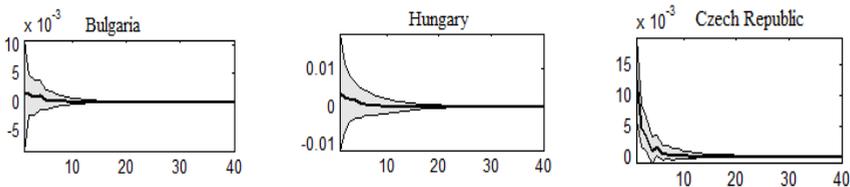
The endogenous variables respond to a tax revenues shock as in the case of government expenditure shock but with greater intensity. Government spending

increases immediately after the net revenues shock but with a low intensity and persistence. The credible intervals accompanying the response of GDP contain zero, thus the reaction of GDP to the spending shock is not estimated precisely at least for the first period. After a few quarters the GDP responses positively. The inflation response is similarly to the GDP response to a positive revenues shock.

The next figures present the impulse responses to fiscal policy shocks for Bulgaria, Czech Republic and Hungary. As the main interest is to analyze the effect of GDP to fiscal shock, in the following figures is presented only the response of GDP.



**Figure 3** Responses of GDP after the Government Spending Shock



**Figure 4** Responses of GDP after the Government Revenues Shock

The effects of GDP to fiscal policy shocks, as has been identified in this approach are very small. These results are consistent with the main empirical studies on emerging markets. The response of GDP to government fiscal shock in Hungary is positive but the fiscal multiplier is small. For Bulgaria and Czech Republic the results for the impact of a government expenditure shock are inconclusive.

A high uncertainty is associated with the responses of GDP to a government revenues shock in Bulgaria and Hungary. The effect on GDP is rather very weak. For The Czech Republic the same conclusion can be made.

## 5 CONCLUSIONS

This paper estimates the effect of fiscal policy shocks using Bayesian technique, based on recursive Cholesky approach as the identification scheme of the structural shocks. Bayesian estimation has the advantage of including prior

information regarding distributions of the VAR parameters in order to obtain more precise estimates.

According to the impulse response functions, I can mention the following: the real output shows a weaker response to fiscal shocks, the fiscal multipliers are positive and small meaning the economic activity is not significantly influenced by fiscal policy in an emergent country.

Further investigations closely related to this approach, that can improve the results obtained consists in using different type of priors or different identification schemes for the fiscal shock.

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## SYSTEMIC RISK CAUSED BY ROMANIAN FINANCIAL INTERMEDIARIES DURING FINANCIAL CRISIS: A COVAR APPROACH

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**Abstract:** *Crisis is a normal situation, based on economic theory regarding the economic stages: recession and expansion. But sometimes, these crises are more severe and the negative effects are felt harder by all financial and banking institutions. The 2008 financial crisis is an example that had a high impact on financial markets volatility. During that period, many financial institutions have recorded significant losses. Therefore, this paper aims to estimate the effects of contagion between Romanian financial intermediaries, more exactly the five financial investments closed funds during the financial crisis period, by using the CoVaR methodology. In order to achieve this, we will analyse the systemic risk contribution of the financial investment funds which are publicly listed at Bucharest Stock Exchange for the period 2008-2013. More precisely, we selected the following financial investment funds: SIF 1 – Banat Crisana, SIF 2 – Moldova, SIF 4 – Muntenia, SIF 5 – Oltenia and SIF 3 – Transilvania. Motivation for choosing this topic is represented by the fact that there is little research on systemic risk in the Romanian financial sector. This research will help us identify the financial investment fund with the most risky investment strategy and causing the highest contribution to systemic risk of the financial sector*

**Keywords:** *correlation, financial crisis, financial investment fund, systemic risk, CoVaR, Value at Risk*

**JEL Classification:** D81; G32

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## 1 INTRODUCTION

Financial world is characterized by permanent changes. There are periods when the entire financial world changes as we could see during the financial crisis of 2008, when strong banks such as Lehman Brothers, Merrill Lynch, and Wachovia went into bankruptcy or have been acquired by other financial institutions and many others suffered, event which released high risk on financial market, risk which is known as systemic risk.

As we know, the SIFs were founded based on law no. 133/1991 in order to manage 30% of public companies capital. This was a huge responsibility, and even now, based on the portfolio they have, the investment strategies used by these five investment funds are critical for the financial sector stability.

This paper aims to estimate the systemic risk contribution of the five financial investment funds which are publicly listed at Bucharest Stock Exchange for the 2008-2013 period.

The paper is organized as follows: section 2 presents a literature review about systemic risk; section 3 presents the methodology and data; the main results are shown in section 4 and the last section concludes the paper.

## 2 LITERATURE REVIEW

One of the most used measures for measuring the risk is represented by Value at Risk. Some researchers (Lambadiaris *et al.*, 2003; Sollis, 2009) did not find any differences between historical simulation, variance-covariance and Monte Carlo simulation when computing VaR.

Several methods appear in the literature for measuring systemic risk. Acharya *et al.* (2012) proposed systemic expected shortfall (SES), while Brownlees & Engle (2012) proposed SRISK index computing the expected capital shortage of a firm during a substantial market meltdown.

In our analysis, we will use the methodology of Adrian & Brunnermeier (2008), namely CoVaR. Using this instrument, we want to determine systemic risk contribution of each financial investment fund, as this measurement for systemic risk highlights the tail distribution. Moreover, this instrument is unidirectional; the systemic risk contribution of financial investment funds to the entire system is not equal with the system systemic risk contribution of that particular financial investments fund.

We are not the first, who applied this methodology, as other researchers, such as Lopez-Espinosa *et al.* (2012) and Mutu (2012) have applied and highlighted the utility of this method.

### 3 METHODOLOGY

#### 3.1 The model

Based on CoVaR, the methodology proposed by Adrian & Brunnermeier (2008), we want to determine which financial investment fund had the biggest contribution to systemic risk for the period 2008-2012.

We will compute the market value of each financial investment fund  $i$  total assets with formula (1), based on which we will compute asset return of each investment fund:

$$A_t^i = \left( N_t^i \cdot P_t^i \right) \cdot \frac{Asset_t^i}{E_t^i} \tag{1}$$

where  $N$  – number of shares;  $P$  –market price per share;  $Asset_t^i$  – book value of total assets at time  $t$  and  $E_t^i$  – book value of total equity at time  $t$ .

Further, we will apply a quartile regression for each investment fund:

$$R_t^i = \beta^i_0 + \beta^i_1 \cdot BET.FI_{t-1} + \beta^i_2 \cdot ROBOR3M_{t-1} + \varepsilon^i_t \tag{2}$$

The estimated parameters from the equation above will be used to compute the VaR of each investment fund:

$$\hat{Va}R_t^i = \hat{\beta}_0^i + \hat{\beta}_1^i \cdot BET.FI_{t-1} + \hat{\beta}_2^i \cdot ROBOR3M_{t-1} \tag{3}$$

Next step is to run the following quartile regression:

$$R_t^{sys|i} = \beta_0^{sys|i} + \beta_1^{sys|i} \cdot BET.FI_{t-1} + \beta_2^{sys|i} \cdot ROBOR3M_{t-1} + \beta_3^{sys|i} \times R_t^i + \varepsilon_t^{sys|i} \tag{4}$$

In the same meaner we will estimate the CoVaR:

$$Co\hat{Va}R_{AP,t}^{sys|i} = \hat{\beta}_0^{sys|i} + \hat{\beta}_1^{sys|i} \cdot BETFI_{t-1} + \hat{\beta}_2^{sys|i} \cdot ROBOR3M_{t-1} + \hat{\beta}_3^{sys|i} \times \hat{Va}R_t^i \tag{5}$$

The risk that an investment financial fund propagates to the system is expressed based on formula (6):

$$\Delta CoVaR_{1\%/5\%}^{sys|i} = CoVaR_{1\%/5\%}^{sys|i} - CoVaR_{50\%}^{sys|i} \tag{6}$$

The main advantages of using the quartile regression over the ordinary least square regression is the robustness of the estimators.

The models will be tested based on the most frequently used test (Anghelache *et al.*, 2013; Oanea *et al.*, 2013; Zugravu *et al.*, 2013), namely the conditional coverage test sustained by Christoffersen (1998):

$$LR_{CC} = -2 \ln \left( \frac{(1-\alpha)^{n_0} \alpha^{n_1}}{(1-\hat{\pi}_{01})^{n_{00}} \hat{\pi}_{01}^{n_{01}} (1-\hat{\pi}_{11})^{n_{10}} \hat{\pi}_{11}^{n_{11}}} \right) \sim \chi^2_{(2)} \tag{7}$$

### 3.2 Data and Descriptive Statistics

This paper analyses the systemic risk of the five financial investment funds listed at Bucharest Stock Exchange: SIF Banat Crisana, SIF Moldova, SIF Transilvania, SIF Muntenia, and SIF Oltenia, during the period of financial crisis. For Romania, the crisis period can be considered the time interval between October 1<sup>st</sup> 2008 and December 31<sup>st</sup> 2012, the period for which a decrease in GDP was recorded.

*Table 1* Descriptive statistics

Variable	Mean	Median	Max.	Min.	S.D.	kewness	Kurtosis
SIF1	0.04%	0.00%	15.03%	-14.86%	0.03	0.018	7.270
SIF2	0.08%	0.02%	26.74%	-21.75%	0.04	0.196	10.980
SIF3	0.06%	0.00%	14.93%	-25.00%	0.03	-0.471	9.990
SIF4	0.03%	0.00%	14.96%	-14.83%	0.03	0.108	8.649
SIF5	0.05%	0.00%	14.87%	-14.89%	0.03	0.041	7.201
SYST	0.06%	0.02%	14.84%	-14.84%	0.03	0.034	8.121
BET-FI	0.00%	0.05%	13.83%	-16.08%	0.03	-0.363	8.800
ROBOR 3M	-0.09%	-0.09%	50.62%	-42.78%	0.03	3.438	150.381

Quarter data for the asset and equity value of each investment fund were obtained from financial reports and based on linear interpolation; these were transformed in daily data. For the same time, the data of stock price and BET-FI for each financial fund were taken from the Bucharest Stock Exchange official site.

We used the same methodology as Mutu (2012), by choosing for CoVaR computation the following state variables: BET-FI index and ROBOR 3months.

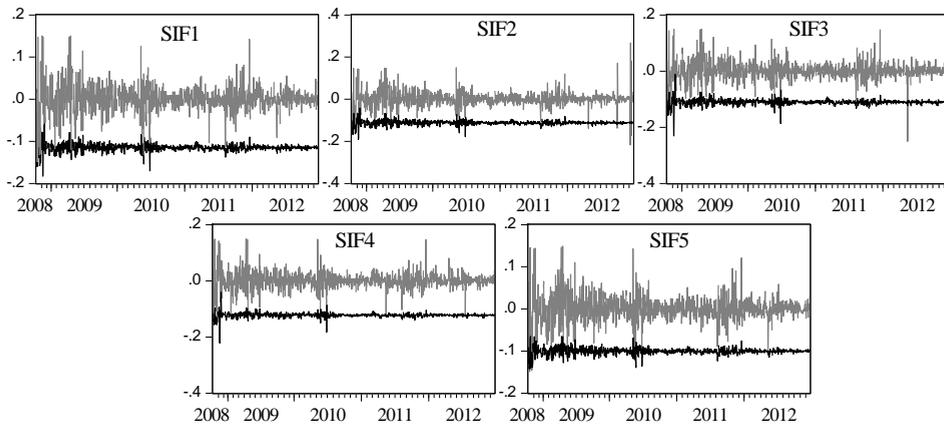
Based on the descriptive statistics presented in table 1, we can see that the highest average variation in asset value is recorded for SIF2, while the lowest one for SIF4. At the same time, SIF2 has the maximum asset variation for the analysed period, having also the highest volatility. SIF3 has a negative skewness, so a longer left tail shows more losses for SIF Transilvania.

The correlation coefficient between BET-FI and ROBOR 3M is only 0.067. The lowest grade of linear association between these two variables allows quartile regression estimation, because the problem related to multicollinearity is avoided. Going further, based on Augmented Dickey Fuller test, we found that all the time series are stationary.

#### 4. RESULTS

We computed the systemic risk for the five financial investment funds mentioned above, using in the analysis the lagged values for one period for BET-FI rate and ROBOR 3 months.

In the analysis for BET rate and ROBOR 3 months rate, we used the lag (1) values, due to the fact that the changes in the financial and monetary market did not occur at the same time with the SIF's asset modification.



*Figure 1* CoVaR (1%) vs. asset returns evolution of each investment fund

In figure 1, we present the CoVaR (1%) and asset returns evolution of each investment fund during the crisis period. Based on our analysis, we found that the highest average CoVaR (1%) is recorded for SIF4, almost 12.2% while, the lowest average value is recorded for SIF5 – 10%. The other SIFs have values around 11%.

**Table 2** SIFs' contribution to systemic risk during financial crisis

Variable	$\Delta\text{CoVaR}_{1\%}$ (million RON)			
	Mean	Median	Min.	Std. Dev.
SIF1 → SYST	-70.55	-70.36	-112.20	5.49
SIF2 → SYST	-68.33	-68.09	-116.06	6.60
SIF3 → SYST	-72.29	-72.04	-150.60	7.28
SIF4 → SYST	-71.50	-71.33	-129.32	5.05
SIF5 → SYST	-75.70	-75.61	-107.08	5.78

Using VaR and CoVaR estimation, we computed the average impact of each financial investment fund on the system formed by these five funds. These results are presented in table 2. We see that the highest contribution to the daily losses of the five investment funds is given by SIF5 (almost 76 million RON). Even if as percentage, SIF5 has the smallest average CoVaR, due to fact that this investment fund has the highest average value for market value of its assets, contribution of the fund to systemic risk is the highest. The lowest contribution is given by SIF Moldova, with an average of 68.4 million RON. Even if the SIF4 has the smallest average assets market value, due to the fact that the average  $\text{CoVaR}_{1\%}$  is the highest, this places the SIF4 on the third position in terms of its contribution to the total systemic risk.

**Table 3.** Conditional coverage test for  $\text{VaR}_{1\%}$  and  $\text{CoVaR}_{1\%}$  models

SIF	$\text{VaR}_{1\%}$		$\text{CoVaR}_{1\%}$	
	LR test value	$H_0$	LR test value	$H_0$
SIF1 – Banat Crisana	5.0452	Accepted	5.0452	Accepted
SIF2 – Moldova	0.9193	Accepted	0.9193	Accepted
SIF3 – Transilvania	1.2046	Accepted	1.2046	Accepted
SIF4 – Muntenia	1.2046	Accepted	5.0452	Accepted
SIF5 – Oltenia	1.2046	Accepted	5.0452	Accepted

Note: The critical value for 99% is 9.210; Under  $H_0$  the model is correctly specified.

The efficiency of the models used in the estimation of VaR and CoVaR was tested based on conditional coverage test sustained by Christoffersen (1998). Back-testing methodology was implemented by using the last 250 observations during the crisis period, namely: January- December 2012, by computing the conditional coverage test, for which the null hypothesis states that the model is correctly specified.

The results presented in table 3, revealed us the fact that the models used to estimate the  $\text{VaR}_{1\%}$  and  $\text{CoVaR}_{1\%}$  for the five Romanian financial investment funds are valid.

## 5. CONCLUSIONS

The results of this paper highlight that the largest contribution to the daily losses of Romanian financial closed investment funds is given by SIF5 – Oltenia (76 millions RON), while the lowest contribution is given by SIF2 – Moldova, with an average of 68.4 millions RON.

We confirmed our models reliability by estimating conditional coverage test, which validates all the models used in estimating systemic risk.

One of the research limitations is represented by the analysed sample – only five closed financial investment funds, due to the fact that we have not included in our analysis any open investment fund. Another limitation can be represented by the small state variable (only two) used in the analysis.

Further research is necessary in the direction of finding which characteristics of each institution, like investment policy, leverage, market-to-book, size, and market beta are influencing  $\text{CoVaR}$ , so that both regulators and financial intermediaries will have an accurate picture of the systemic risk and contagion effects on the Romanian financial investment funds in order to take the best decisions for the stability of the financial sector.

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# THE MONETARY POLICY UNDER THE IMPACT OF THE RECENT GLOBAL FINANCIAL CRISIS

Angela ROMAN\*, Diana PURCEL\*\*

**Abstract:** *Major negative implications of the recent global financial crisis on the financial system, monetary transmission mechanism and the real economy led to unprecedented, rapid, strong actions and of considerable size from central banks, particularly in developed countries severely affected.*

*From the perspective of monetary policy, central bank reactions have resulted in progressively and of unprecedented size decreasing of the monetary policy interest rate, adjustment of conventional monetary policy operational framework and, in particular, the designing and use of new tools, specific for the crisis period, respectively the unconventional monetary policy instruments.*

*In this context, our paper aims to highlight, mainly, some innovative actions taken by some major central banks, aiming mainly to facilitate the transmission of monetary policy on the real economy and restore the confidence of market participants in the financial system. Also, our study highlights some of the effects and potential costs of innovative instruments for monetary policy, and the challenges posed by these to central banks.*

**Keywords:** *central banks, financial crisis, unconventional monetary policy, exit strategies*

**JEL Classification:** *E44, E52, E58*

## 1. INTRODUCTION

The serious implications of the recent global financial crisis on the financial system and the real economies have led to unprecedented reactions of central banks, particularly in the countries severely affected. The actions of central banks

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have been materialized besides in a significant reduction of the interest rate of monetary policy up to a level close to 0%, also in an adjustment of monetary policy operational framework, but especially in the adoption and implementation of innovative instruments for monetary policy. The last ones, known as unconventional monetary policy measures, have been materialized in operations initiated by central banks, which have led to changes in the size and structure of their balance sheets, and in actions aimed to guide expectations regarding longer-term interest rates (Peersman, 2013).

The literature review presents a significant number of studies that analyze the monetary policy measures taken by the central banks of various countries, in the context of the recent financial crisis. Among the empirical studies, the attention is drawn by those that are focused mainly on the analysis of the typology, characteristics and implementation framework of unconventional monetary policy instruments (Borio & Disyatat, 2009; Cecioni *et al.*, 2011; Krekó *et al.*, 2013), on the investigation of the overall impact and challenges of unconventional policies (Shirai, 2014), but also by those focused on highlighting the effects and limits of these policies (Lenza *et al.*, 2010; Peersman, 2013; IMF, 2013a). According to Trichet (2013), the introduction on a large scale of the unconventional monetary policy measures by the central banks of some developed countries, has been a defining feature of the global financial crisis.

Our paper aims to highlight the impact of the recent global financial crisis on the monetary policy and it is structured as follows: the second section summarizes the unconventional monetary policy measures adopted by some major central banks in the context of the financial crisis; the third section focuses on highlighting some effects and potential costs involved by the use of unconventional instruments, but also on some challenges that arise for central banks engaged in the implementation of these instruments. The study ends with conclusions.

## **2. THE TYPOLOGY AND THE ROLE OF UNCONVENTIONAL MONETARY POLICY INSTRUMENTS**

In the context of the international crisis on the background of financial system instability amplification, increasing macroeconomic risks and deepening global economic recession, the central banks of some developed countries have resorted to progressive and significant reductions of the monetary policy rate to a level close to 0%,

but also have resorted to the use of other traditional monetary policy instruments. However, these actions of central banks have had a reduced efficiency because they failed to remedy the dysfunctions of the financial system and of the monetary policy transmission mechanism. In this context, some central banks have demonstrated exceptional capacity for innovation by creating new monetary policy instruments specific for the period of crisis: the unconventional monetary policy measures. These measures are designed and implemented in order to facilitate the transmission of monetary policy rate on the real economy and to restore the confidence in the financial system.

Agreeing with Smaghi (2009), unconventional monetary policy measures are those measures that directly affect the cost and availability of external financing of banks, households and non-financial corporations and whose ultimate goal is to keep inflation close to the target level, prevent the collapse of financial intermediation and reduce the magnitude of the economic downturn (Krekó *et al.*, 2013).

According to specialized literature (Krekó *et al.*, 2013), non-conventional monetary policy instruments can be structured on the basis of several criteria. Thus, depending on the ways of interventions, there are three types of measures: *facilities that provide liquidity to commercial banks, direct interventions in the credit market* (purchases of corporate securities and mortgage bonds, direct lending) and the *purchase of government bonds*. According to IMF (2013a), two main types of unconventional monetary policies can be defined depending on the aimed objective: *policies aiming to restore the functioning of financial markets and intermediation* (used in particular in the euro area, the UK and the U.S.A.) and *policies oriented at supporting economic activity* while the monetary policy rate approaches the zero lower bound, either by forward guidance on interest rates or by buying bonds (implemented mainly in Japan, U.S.A. and UK). Although these two types of unconventional policy are conceptually distinct, they are interrelated and, ultimately, have the same major objective, namely to support macroeconomic stability.

Unconventional monetary policy measures designed and implemented by the central banks of the developed countries and, more widely, their interventions in the context of the crisis present particularities from one country to another, determined, naturally, by the characteristics of the financial system and of the national economy (see table 1). In the sphere of non-conventional measures used by the central banks stands out, in particular, enhanced credit support, credit easing, quantitative easing, interventions in foreign exchange and securities

markets and the provision of liquidity in foreign currency (Trichet, 2013). All these measures are used to support the functioning of the financial system, reinforce the real economy, but also to maintain price stability in medium term.

Initially, in the early stages of the crisis, the unconventional measures adopted were closer to the traditional role of the central bank as lender of last resort, aiming to correct the malfunctions of the financial system and preventing the collapse of investor confidence. Thus, some major central banks (especially the ECB, FED, BoJ) provided liquidity at unprecedented dimensions to a much larger number of beneficiaries in order to support market functioning. Following the implementation of these measures, there has been a strengthening of the balance sheets of commercial banks (IMF, 2013a). Subsequently, the unconventional measures were focused on mitigating the decrease of financial intermediation, relaxing borrowing constraints on financial institutions, reducing the borrowing costs and supporting the credit flow to the real economy. Such measures consisted of (IMF, 2013b): the funding for lending scheme (in the UK), the purchase of mortgage backed securities and agency debt (in U.S.A.), bank covered bonds (in the euro zone), and also the purchase of various private assets (in Japan).

*Table 1* Interventions of some important central banks in recent years

<b>Instruments</b> <b>Central Banks</b>	<b>BoE +</b>	<b>BoJ +</b>	<b>ECB* +</b>	<b>FED +</b>
<b>Direct interest rate tools</b>	Cut to 0.5% in March 2009	At zero since the mid - 1990s	Cut to 0.75% in July 2012	Cut to 0.0-0.25% in December 2008
<b>Asset purchases</b>	✓	✓	✓	✓
<b>Supporting liquidity and credit provision</b>	Special Liquidity Scheme (now closed); Discount Window Facility; Indexed Long-term Repo operations; Extended Collateral Term Repo Funding for Lending Scheme.	Fund-Provisioning Measure to Stimulate Bank Lending.	'Fixed Rate Full Allotment' in Main Refinancing Operations and Longer-Term; Refinancing Covered Bond Purchase Programme.	Money Market Investor Funding Facility; Commercial Paper Funding Facility; The Term Securities Lending Facility (all now closed).
<b>Exchange rates</b>		Coordinated G7 intervention in international foreign exchange markets in 2011; two unilateral yen/dollar interventions in 2012.		
<b>Communication - forward guidance</b>				The limitation of the monetary policy interest rate and the anchoring of inflationary expectations; Assets purchases conditioned by the situation on the labor market.

\* Deposit rate on commercial bank reserve balances cut to zero. + Liquidity swap lines between central banks.

Source: HM Treasury, 2013, pp. 55-56

Given that the monetary policy interest rates were close to the zero lower bound, some major central banks, especially the FED, Bank of England and Bank of Japan, have resorted to adopting and implementing other unconventional measures, focused on supporting the real economy, respectively, expanded forward guidance and bond purchases. These measures had as main objective the reduction of longer-term bond rates and easing monetary conditions.

Overall, following the implementation of non-conventional measures have been registered a considerable increase in the size of central banks' balance sheets, as can be seen in figure 1. Also according to Hannoun (2012), it is worth noting, in the case of some major developed economies, that currently the central banks assets exceeded 20% of GDP.

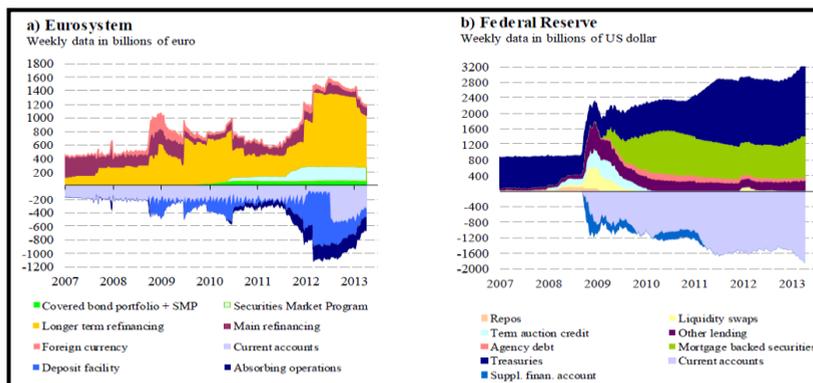


*Figure 1* The dynamic of central banks assets as a percentage of GDP\* in the period 2007 – 2013

\* Nominal GDP in 2011

Source: Pattipeilohy *et al.*, 2013, p. 36

Moreover, the use of unconventional measures has led to unprecedented changes in the structure of central banks' balance sheets (see fig. 2). Thus, it is noteworthy, especially in the case of ECB and FED, the rate of the increase of balance sheet assets, evolution that does not seem, at least not yet, to slow down, given that market participants expect that central banks will continue to implement new measures to support the real economy and to counter financial market failures (Hannoun, 2012).



**Figure 2** Eurosystem and Federal Reserve Balance Sheets

Source: Pattiyeilohy et al., 2013, p. 37

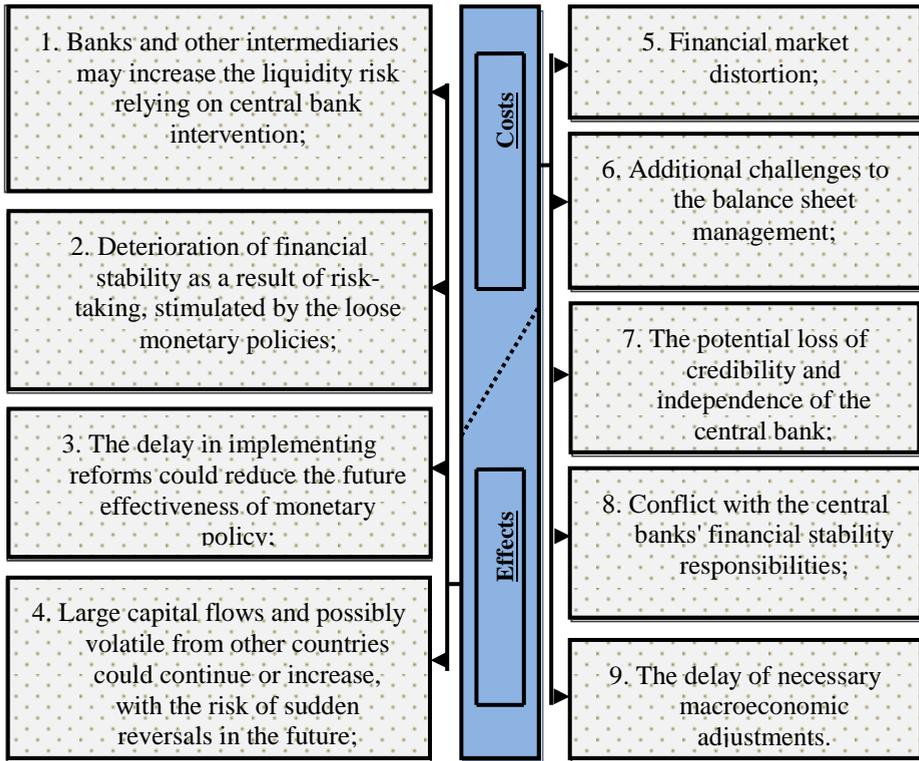
### 3 EFFECTS OF UNCONVENTIONAL MONETARY POLICY IMPLEMENTATION

Using, in the context of the crisis, monetary policy innovative instruments, respectively unconventional measures, has led to an intensification of the concerns of the decision makers and of the researchers in order to know how these could affect the conduct of the monetary policy, but also of the potential costs which they imply (Kozicki *et al.*, 2011). Thus, according to some studies, the implementation of unconventional measures could generate some risks and undesirable effects (see fig. 3), which should be considered when undertaking such measures.

Although the application of unconventional measures proved effective, especially in the context of worsening financial system dysfunctions, but also in the case of supporting aggregate demand, it is estimated that the positive effects involved by these measures should be regarded to some extent, respectively monetary policy can not solve by itself structural banking problems or amplify the growth potential in the medium and long term (IMF, 2013b).

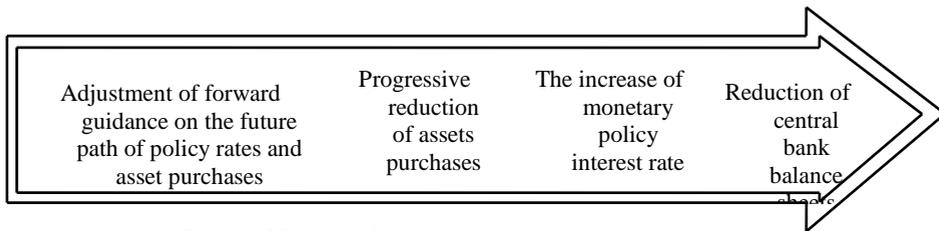
Unconventional monetary policy measures are temporary and are intended to be used only in a crisis situation. Thus, as it improves the functioning of financial markets and the economy in general, keeping them is no longer justified. Therefore, abolishing these measures is conditioned by the restore of the normal functioning of financial markets and the recover of the real economy. From this perspective, central banks face a new challenge, namely, designing and implementing appropriate strategies to renounce to unconventional policies, depending on the particularities of each country. According to Kozicki *et al.* (2011) abolishing these policies should be

guided by certain principles, namely: the output to be conditioned by objectives regarding inflation or price stability, by information regarding the economic outlook, including fiscal one, which would help strengthen the credibility of central banks; maintaining the credibility and the independence of central banks in order to ensure in the future the effectiveness of monetary policy; communication on exit strategies should be clear and include timely reporting of balance sheet developments.



**Figure 3** Effects and potential costs of using unconventional monetary policy measures  
 Source: Own simulation based on IMF, 2013b; Kozicki et al., 2011

Another problem that arises in relation to exit strategies refers to the correct determination of the timing and the rhythm of abandoning innovative policies. From this perspective, as demonstrated by past experience, the main risk relate to a late and slow exit (Borio & Disyatat, 2009).



**Figure 4** Stages of unconventional policies exit strategy

Source: Own simulation based on IMF, 2013a

Giving up unconventional measures involves specific stages (see fig. 4) - some of them being overlapped - and seeks a return to conventional monetary policy in which the monetary policy interest rate resumes its fundamental role for signalling monetary policy orientation.

#### 4 CONCLUSIONS

The serious implications of the recent global financial crisis on the financial system and real economies resulted, from a monetary policy perspective, in unprecedented reaction of central banks, particularly in developed countries severely affected.

In the context of the international crisis on the background of financial system instability amplification, increasing macroeconomic risks and deepening global economic recession, the traditional instruments of monetary policy used by central banks have not proven effective or had a low efficiency because they failed to remedy the malfunctions of the financial system and restore normal functioning of the monetary policy transmission mechanism. However, some central banks have shown a remarkable capacity for innovation by creating new monetary policy instruments specific for the period of crisis, respectively unconventional monetary policy measures. Using these measures, different from one country to another depending on the particularities of the national economic and financial environment, has been effective at least in the short term because they managed to prevent the collapse of the financial system and support the real economy. On the other hand, as the literature reveals, unconventional monetary policy measures generate some risks and costs that should be taken into account by central banks.

From the perspective of unconventional measures, because they are temporary and are intended to be used only in conditions of crisis, central banks face a new

challenge, namely the design and implementation of appropriate strategies to renounce these measures. By abandoning unconventional policy, central banks aim, naturally, to return to conventional monetary policy in which monetary policy interest rate resumes its fundamental role for signaling the monetary policy orientation.

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## FINANCIAL REFORM IN (EASTERN) EUROPE: WHICH WAY?

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***Abstract:** Since the financial crisis of 2007-2008 and the economic depression as well as the sovereign debt problems that ensued, the official international reaction has been preponderantly in favor of more regulation and central inter-coordination and planning. Specifically, in Europe, the European Financial Stability Fund (later the European Stability Mechanism) was created to bail troubled institutions out. The European Systemic Risk Board was created in 2010 and similar or subordinated organisms are being established at national levels in order to assure that the stability, once propped by the aforementioned organisms, is not lost again. The ESRB is geared precisely toward more centralization of policy and coordination between regulatory and supervisory agencies hitherto more specialized and limited in scope. The present paper analyses the general solution chosen by the EU and discusses the possibility and consequences of alternative financial arrangements. Starting from the essential insight that the main historical root of world financial instability is the practice of fractional reserve banking, we argue that the European chosen solution is ultimately headed to failure, and so is the Europe-wide bail-in suggested more recently, while there are alternatives, discussed herein, that are more or less suited to bring a future of financial stability.*

***Keywords:** Banking, Financial Sector, Fractional Reserves, Reform*

***JEL Classification:** G21, G23, G28*

### 1 THE PROGRESSION IN BANKING CENTRALIZATION

The apparent calm that dominated the economic and financial landscape in Europe at the beginning of the new millennium has given way since the summer of 2007 to financial turmoil and economic depression. The financial troubles

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were manifest in the banking sector as well as in the sovereign sector (Lapavitsas *et al.*, 2010). The sovereign problems appear to most researchers to be correlated to the banking problems. When the losses of the banks were covered by the public purse, the markets reflected higher expectations of sovereign default (Mody & Sandri, 2012). Indeed, sovereign risks are secondary in their nature, as they reflect a translation of the effort to cope with losses from the banking sector to the public sector.

### **1.1 The Fractional Reserve Problem**

The history of banking and sovereign indebtedness is closely intertwined, but the primary source of instability resides in the banking sector. Banking crises were known since the European Middle Ages (Huerta de Soto, 2012), preceded the institution of the central bank and have increased in intensity and duration after the creation of the central bank, and all the more so since the extinction of the gold standard and the advent of indefinitely elastic paper money.

In addition, banks have traditionally been the creditors of the treasury and the central bank has come to play a very integrated role in the process of money creation and spending for public purposes (Rothbard, 1974).

There is a compelling case the latest global and financial crisis represented the motive for further advancement in a secular process of integration and centralization. This process has evolved intermittently with each crisis that occurred in different parts of the world.

Its ultimate cause is the practice of fractional reserve banking (Mises, 1980). Nothing else in financial activity (understood here in a broad sense, as including all types businesses involving money deposits and credit intermediation) suggests inherent instability (Spiridon, 2005).

Fractional reserve banking, however, is inherently unstable. Banks that lend out money contracted on demand from clients, or banks that issue more money substitutes than reserves available, put themselves in a position of impossibility to redeem part of their obligations. Their situation is inherently unstable, and, tends to be revealed with the occurrence of each crisis.

### **1.2 Periodical Crises and the Steps of Centralization**

The crises are bound to occur periodically because they are indirectly caused by the fractional reserve practice of the banks. The causal link between fractional

reserves and crises is described by the Austrian theory of the business cycle (Rothbard, 2004). The inevitable start of the downturn in the cycle, the moment when businesses in the more capital intensive sectors of the economy start going bankrupt, is usually also the moment when banks face redemption demands that they cannot fulfill.

Historically, the solution to the problem of banking instability was the emergence of the central bank as a lender of last resort. The central bank has traditionally used the pooled fractional reserves of the member banks in order to stave off the bankruptcy of troubled banks.

We see in this development the first step toward the integration and centralization of the banking sector. However, this level does not assure stability. The problem the central bank was designed to solve is not actually solved, but moved to a higher level, by the competition between member banks, now even more stimulated to expand by moral hazard (Hülsmann, 2006). The central bank has to impose a strict control of the member banks, but this centralized control cannot be conducted on a rational basis. The central bank cannot find the maximum levels of indebtedness at which the depositors would still not ask for redemption of their substitutes, simply because under a fractional reserves regime it is impossible. The fractional reserve principle affects this time the stability of the central bank. If the member banks expand credit and then become illiquid in such a sufficient number or size as to go over the limit imposed by the scarcity of centralized reserves, then the central bank becomes itself bankrupt.

The solution for this problem comes either from a cooperation with other central banks or from support from the public authorities (Hülsmann, 1997). A cooperation with other central banks, be it under the shape of a regional or international central bank, or of more or less temporary services specific to the lender of last resort function, essentially consists in accumulating larger pools of fractional reserves. Again, the problem is not solved, but made bigger. This would be the third step of the progression toward more centralization. The same reasons will make the centralized scheme come to a point of bankruptcy. We can safely include at this stage the creation of the deposit insurance fund. This type of institution is essentially similar to the central bank: a pool of resources to be used in case of bank runs and other situations when a bank becomes incapable of redeeming the funds deposited with it.

The plea for support with the authorities is the fourth step of the progression. This support can come in different ways. We can split them in two traditional categories: regulatory and fiscal.

In the regulatory category, one choice is the suspension of payments, or a bank holiday. If a particular bank is in trouble, it can be granted the privilege of suspending payments. Usually, because of the contagion effect, all banks are offered this temporary privilege.

Another way of insulating the banking sector from bankruptcy is the substitution of a stricter monetary standard for a less strict standard. The central reserve limit is much more elastic under the paper money standard than under the gold standard. This is the main reason for the abandonment of the gold standard (Salerno, 2011). But, even under a paper standard these limits exist. They are technical and economic limits. The technical difficulty is this: the printing, distribution and handing of paper reserves cannot be as instant and space efficient as the creation of electronic substitutes. This limit can be further relaxed by outlawing the paper standard and making the electronic substitutes the money proper. We see this trend being presently underway in different parts of the world, with countries such as France, Portugal and Sweden being more advanced in severely limiting the use of cash, either by law or by banking policy.

Even if this technical difficulty is overcome, there still remains the economic difficulty that consists in the hyperinflationary limit of a monetary regime, the speedy and exponential loss in value that precedes the flight into real values – if no other currency can be chosen by the market (Mises, 1998).

When these regulatory types of support are exhausted the fiscal types of support are chosen. The treasury supports the banking sector with funds obtained through taxation or sovereign indebtedness, which is ultimately, postponed taxation. However, this is already a paradoxical situation, since traditionally the State was the main client of the banks, benefiting from the capacity of banks to create credit as a much more easy form of financing the treasury, than taxation or public debt.

In this phase, the capacity of funding is driven to the maximum allowed by the economic fundamentals and public resistance. The sovereign debt and social funds problems put enormous strain on the treasuries of the European governments, the banking sector has its own inextricable problems and instead of funding the

government, it is itself asking for bailouts from the government. Further reserves could be summoned by another step up the centralization path, either at banking or state levels, or at both.

### **1.3 The Endgame for this Progression**

This escalation of the fundamental problem of banking can offer temporary respites as long as the centralization has not reached a planetary level. From this point of view, one can say that there are still many years before no further steps can be taken. Also, periods of retreat from this trend can be followed by periods of escalation, and this can indeed postpone the final demise of the whole system, but not without additional costly consequences.

However, one thing must be clear: each recurring crisis reveals systemic squandering of valuable resources, the economic development is hampered, stagnation reigns, and the end point of this progression cannot be anything else than disastrous widespread failure.

## **2 THE RESPONSE IN EUROPE**

The current financial situation in Europe is apparently stabilized by the measures adopted at European Union and international levels. There have been bail-outs of banks and governments, the European Central Bank began accepting new classes of lower quality assets, and has been temporarily funded by the Fed with dollars, through repurchase agreements in what amounts to a strong cooperation of the main central banks of the world.

The European Financial Stability Fund has been created and then transformed from a temporary solution to the more permanent European Stability Mechanism. The European Systemic Risk Board was created in 2010 and similar or subordinated organisms are being established at national levels in order to assure that the stability, once propped by the aforementioned organisms, is not lost again. The ESRB is geared precisely toward more centralization of policy and coordination between regulatory and supervisory agencies hitherto more specialized and limited in scope.

In what is called a worldwide effort for oversight and regulation of shadow banking (FSB, 2013), the European regulatory institutions intend to further strengthen the control over the banking sector traditionally supervised by the

central bank, to extend this kind of oversight in order to treat the money market funds like the traditional banking institutions, and to globally control securitization and securities financing transactions.

The general attitude is not critical to this regulatory trend (Hall, 2012). Indeed, there are calls for swifter centralization at European, supranational level, “or essentially ‘a move to a full fiscal union’”. These voices decry the fact the control is at this point designed to be effected only at a “purely intergovernmental level” (Gocaj & Meunier, 2013, p. 250).

Besides the trend to full global regulatory centralization of the financial sector, we can also see that the progression is at this moment in Europe at this point: we can see signs of the aforementioned push for raising the elasticity of the paper monetary standard through cash restrictions (ECB, 2012), and there are proposals to use depositor’s money for bail-ins, thus erasing the distinction between a credit contract and a stock purchase, as we have witnessed in the novel institutional approach of the crisis in Cyprus (Persianis, 2013).

### **3 A DISCUSSION OF ALTERNATIVE SOLUTIONS**

After criticizing the current path, we will take a look at some currently relevant alternative proposals. They all have in common the fact that they are variations of the idea that the current progression has to be reversed for the growing problems to be effectively solved.

#### **3.1 Solutions Based on Bail-in**

As distinguished from bail-out of banks or government with external funds, the bail-in is the solution of transforming the creditors into shareholders. In this case the funding is confined to the entity to be saved from bankruptcy. Bagus *et al.* see the solution of bail-in as preferable to the bail-out, because it eliminates the indiscriminate character for the public bail-out, moral hazard, regulation of private decisions, the lack of an exit strategy for the government, and regime uncertainty (Bagus, Julián, & Neira, 2012).

The bail-in solution is also advocated in this case as a preferable alternative to a more laissez-faire policy of just letting the governments default and the banking and financial institutions go bankrupt. It is very important at this point to stress that the choice between liquidation and bail-in should be voluntary and

should belong entirely to the creditors, with no government participation. The authors argue that the laissez-faire option is suboptimal because of the aggravating circumstance of the secondary depression that sets in and is reinforced as the volume of elastic currency is over-shrunk by the credit crunch. Even if we assume the secondary depression to be a legitimate concern, the main problem of the bail-in is that – if it actually is a fiat bail-in, as in the case of Cyprus – it replaces the bail-out problems mentioned above with the de facto abolition of banking as credit intermediation. The forced bail-in, to the extent that it overrides the contracts of the creditors, is replacing an unjust measure against taxpayers, with a – admittedly less pernicious – coercion of the creditors.

Moreover, if the fiat bail-in becomes standard policy, we will only have shareholders in (very liquid) money market funds, and no creditors. Thus, a traditional institution is reformed out of existence. On the other hand, “by encouraging the [voluntary] introduction of renegotiation-friendly provisions into loan contracts” (Eichengreen & Rühl, 2001, p. 5), the bail-in can be viewed as a solution for future problems, but it hardly addresses the current need for reform. Rather, it is a palliative measure with the potential of being hijacked toward more regulation and encroaching upon the private sector in the drive for more centralization.

### **3.2 The (almost) total Overhaul of the Monetary and Financial System**

The radical problems that the European economies face today ask for radical answers. Several systematic approaches to monetary and banking overhaul are surveyed in Bagus (2008). He criticizes the reform plans proposed by Mises, Rothbard, Sennholz and Huerta de Soto for their more or less minor defects, and then proceeds to offer his own proposal for radical reform (Bagus, 2009).

Indeed, the seminal principle of fractional reserve banking should be abolished, and the same should happen to all the institutions and practices that emerged as seeming solutions for the problem created by it.

That includes all regulations that affect the choice of monetary standard: the monopoly of monetary production, the legal tender laws, and the barriers to producers that want to enter the market for money production. Also, there should be complete freedom in banking, including the absence of any privilege to banks – that should observe the same laws as all other market participants. All

institutions and agencies that manage today the centralized financial environment would lose their purpose and would have to be dissolved, including first of all the central banks.

This kind of radical measures may be considered inappropriate at this point. But if the centralization trend continues unabated, the time will come when it will not be possible to postpone the reform.

#### 4 CONCLUSIONS

We have seen that the current European approach in dealing with the financial and sovereign crisis is based on treating symptoms instead of removing the cause. The real solution should be based on removing the principle of fractional reserve from banking. That would go a long way in eradicating from the rest of the financial sector the financial institutions, practices, and products that are fueled by artificial credit expansion.

We have discussed two types of alternative reform proposals. They have different degrees of expediency, but they can also be criticized as imperfect from the economic point of view. They are all steps in the right direction, but the most important conclusion in weighing these alternatives is this: If a principle is clear, then it should be applied in its purest form.

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## MONETARY POLICY TRANSMISSION MECHANISM AND DYNAMIC FACTOR MODELS

Andreea ROȘOIU\*

**Abstract:** *The main objective of a Central Bank is price stability, without neglecting, however, a sustainable economic growth in the long run. Therefore, an important challenge is to identify whether the effect of monetary policy has changed over time and for this purpose, a Dynamic Factor Model with time-varying parameters is estimated. The model is applied to Romanian economy, on a sample database consisting of 90 time series representing various macroeconomic variables. Monthly data, starting with 2000 and ending with 2013 are being used for the analysis. The reason for using a large dataset is to avoid issues such as omitting important information when considering a small set of variables. A much smaller number of Factors is extracted by using Principal Component Analysis and with these factors the TVP-FAVAR model is estimated. Time variation of the parameters allows for a comparative analysis of the monetary policy transmission mechanism in time. Once the impulse-response functions are estimated, several conclusions are to be drawn, such as: whether monetary policy actions have or do not have an impact over the evolution of the rest of the economy and whether the effect of these measures have changed over the years.*

**Keywords:** *Factor Augmented Vector Autoregression, Monetary Policy Transmission Mechanism, Romanian Economy, Time Varying Parameters*

**JEL Classification:** *E31, E52, C15, C58, C82*

### 1 INTRODUCTION

The effect of the monetary policy on the economy and its evolution over time poses the analysis in front of a very challenging task due to the importance of understanding the degree of effectiveness of the monetary policy nowadays. The

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main objective of the Central Bank became price stability once the inflation targeting regime was adopted. In ensuring price stability, the bank should not neglect the sustainability of the economic growth.

Structural vector autoregression models are widely used in order to trace out the effect of monetary policy innovations on the economy. However, there are some drawbacks of these models, one of them being the potential lack of information that could arise due to the fact that a small subset of variables is included in these models. Policymakers are considering a wide number of variables when adopting a certain decision and for this reason, estimated models should be adjusted such that to consider this aspect.

By combining the theoretical insights provided by the VARs with the factor methods' ability to extract information in large datasets, motivates the development of factor augmented VARs or FAVARs.

This paper is organized as follows: a description of the model is done in the second section, *Model Framework*, the third section presents the *Results of the Estimation* and the final section concludes and also provides some ideas for further research.

## 2 MODEL FRAMEWORK

### 2.1 TVP-FAVAR Methodology

The model used in this paper is a Time Varying Parameter FAVAR (TVP-FAVAR), having both drifting coefficients and drifting variance-covariance matrix. Similar to Primiceri (2009), these drifting coefficients are used to capture time variation in the lag structure of the model. And the stochastic volatility is used to capture possible nonlinearities in the simultaneous relations between the variables of the model.

A structural VAR has the following representation:

$$\mathbf{y}_t = \mathbf{b}_1 \mathbf{y}_{t-1} + \dots + \mathbf{b}_p \mathbf{y}_{t-p} + \mathbf{v}_t \quad (1)$$

where  $\mathbf{y}'_t = [\mathbf{x}'_t, \mathbf{r}_t]$ ,  $\mathbf{x}_t$  is a  $(n \times 1)$  vector of variables such as industrial production indexes, industrial production prices, monetary aggregates, exchange rates, interest rates, indexes of consumer prices, employment rates.  $\mathbf{r}_t$  could include only the monetary policy instrument, or some other variables too, such as

inflation rate and unemployment rate in the following order: inflation first, unemployment rate second and monetary policy interest rate last. The coefficients  $b_i, i = 1, \dots, p$  are of dimension  $(n \times n)$  and  $v_t \sim N(0, \Omega)$  with  $\Omega$  a  $(n \times n)$  covariance matrix.

By decomposing an  $n$ -dimensional vector of observables  $x_t$  into a lower dimensional vector of  $k$  (much smaller than  $n$ ) unobserved factors,  $f_t$ , there could be considered hundreds of variables. What needs to be mentioned is that all the parameters of the FAVAR are stochastic.

The time-varying parameters factor-augmented VAR has the following representation:

$$y_t = b_{1,t}y_{t-1} + \dots + b_{p,t}y_{t-p} + v_t \quad (2)$$

where  $y'_t = [f'_t, r'_t]$ ,  $f_t$  is a  $(k \times 1)$  vector of latent factors and  $r_t$  having the form described before. The coefficients  $b_{i,t}, i = 1, \dots, p$  are of dimension  $(k \times k)$  and  $v_t \sim N(0, \Omega_t)$  with  $\Omega$  a  $(k \times k)$  covariance matrix for each  $t = 1, \dots, T$ . This is the measurement equation.

The link between  $x_t$  and  $f_t$  is given by the transition equation, which takes the following form:

$$x_t = \lambda_t^f f_t + \lambda_t^r r_t + u_t \quad (3)$$

where  $\lambda_t^f$  is a  $(n \times k)$  matrix,  $\lambda_t^r$  is  $(n \times 1)$  and  $u_t \sim N(0, H_t)$  with  $H_t = \text{diag}(\exp(h_{1,t}), \dots, \exp(h_{n,t}))$  of dimensions  $(n \times n)$ , for each  $t = 1, \dots, T$ .

Also,  $E(u_{i,t}f_t)$  and  $E(u_{i,t}u_{j,s})$  are assumed to be zero, for  $i, j = 1, \dots, n$  and  $t, s = 1, \dots, T$  for  $i \neq j$  and  $t \neq s$ .

Due to the fact that the covariance matrix from the measurement equation is assumed to be a diagonal matrix, the parameters from this equation can be estimated equation by equation.

The following triangular reduction of  $\Omega_t$  is considered:

$$A_t \Omega_t A_t' = \Sigma_t \Sigma_t' \quad (4)$$

•  $A_t$  is a unit lower triangular matrix:

$$A_t = \begin{bmatrix} 1 & 0 & & 0 \\ \alpha_{21,t} & 1 & \dots & \dots \\ \vdots & & \ddots & 0 \\ \alpha_{(k+1)1,t} & \dots & \alpha_{(k+1)k,t} & 1 \end{bmatrix} \quad (5)$$

•  $\Sigma_t$  is a unit lower triangular matrix:  $diag(\sigma_{1,t}, \dots, \sigma_{k+1,t})$

The list of parameters that are to be estimated are:  $B_t$ ,  $\alpha_t$ ,  $\log(\sigma_t)$ ,  $\lambda_{i,t}$  and  $h_{i,t}$ , where  $B_t = (b'_{1,t}, \dots, b'_{p,t})$ . All these parameters are modeled as random walks, except  $\sigma_t$ , who is assumed to evolve as geometric random walks. The random walk assumption presents the advantage of focusing on permanent shifts and reducing the number of parameters in the estimation procedure.

Principal component analysis is a multidimensional analysis technique which has as a main purpose the decomposition of the total variability of the initial space with a minimum loss of information. Moreover, this decomposition is done by keeping only a small number of components and making sure that it does not include informational redundancy. The new characteristics that were obtained after applying a certain transformation to the initial characteristics are called principal components. The transformation mentioned before has to be optimal and this optimality consists in ensuring a representation of the objects with a minimum loss of information when passing from the old characteristics to the new ones. Therefore, a condition is imposed: minimizing the loss of information. One measure of the importance of a principal component is to assess the proportion of the total variance attributed to that principal component.

## 2.2 Bayesian inference

The posterior distributions of the parameters of interest which are the unobservable states and the hyper-parameters are evaluated by using Bayesian methods. Classical maximum likelihood estimator is not used because of the following drawbacks: difficulties in dealing with high dimensionality and nonlinearity. Moreover, even though it might be possible to write down the likelihood, it is very difficult to maximize it over such a high dimensional space.

Bayesian methods are those that deal efficiently with the issues related to high dimension of the parameters space and the non-linearity of the model. Also, one reason for using these methods is given by the existence of unobservable components. A particular variant of Markov Chain Monte Carlo methods is Gibbs

sampling, which is used for posterior numerical evaluation of the parameters and consists of drawing from conditional posteriors with lower dimension than joint posterior of the whole parameter set.

### 3 RESULTS OF THE ESTIMATION

#### 3.1 Data Transformation

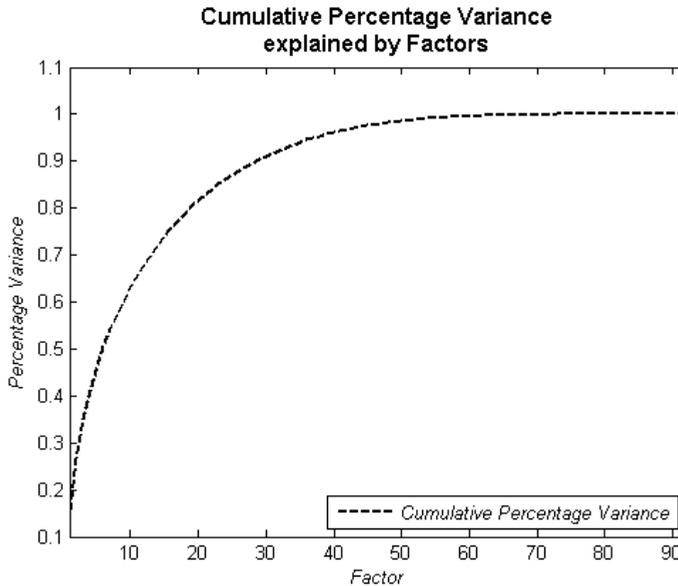
The matrix  $\mathbf{x}_t$  is made out of 92 variables, with data starting from 2001:M1 up until 2013:M6 and covering Romanian economy. Just as mentioned before, there variables are: industrial production indexes, industrial production prices, monetary aggregates, exchange rates, interest rates, indexes of consumer prices, employment rates.  $\mathbf{r}_t$ , on the other hand, is made out of inflation rate, unemployment rate and money market interest rate. All series were already downloaded as seasonally adjusted from Eurostat for consistency regarding the methodology.

Several transformations were applied afterwards, such as: level (no transformation), first difference, log-level, log-first difference. The following step into transforming the data so that to be able to run the, was to check for the existence of unit roots. For this purpose, Augmented Dickey Fuller (ADF) test and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test were applied. They both deliver the same results and the reason they are used together is to ensure better evidence regarding the stationarity of the data. In the end, the time series were standardized in order to allow for principal components extraction.

#### 3.2 Factors and Variability

Empirical studies, such as Stock and Watson (1999) showed that the first three to seven principal components capture most of the variance in the series. Therefore it can be noted that, for example, the first three components retrieve approximately 35.07% from the total amount of information and the first five components retrieve approximately 46.38% from the total amount of information (fig. 1). Bernanke, et al. (2005) stated that the number of factors that is suggested by a statistical criterion may not coincide with the real number of factors. Two situations are investigated in this paper: with three factors (meaning a VAR with six variables – three unobservable and three observable components) and with five factors (meaning a VAR with eight variables – five unobservable and three

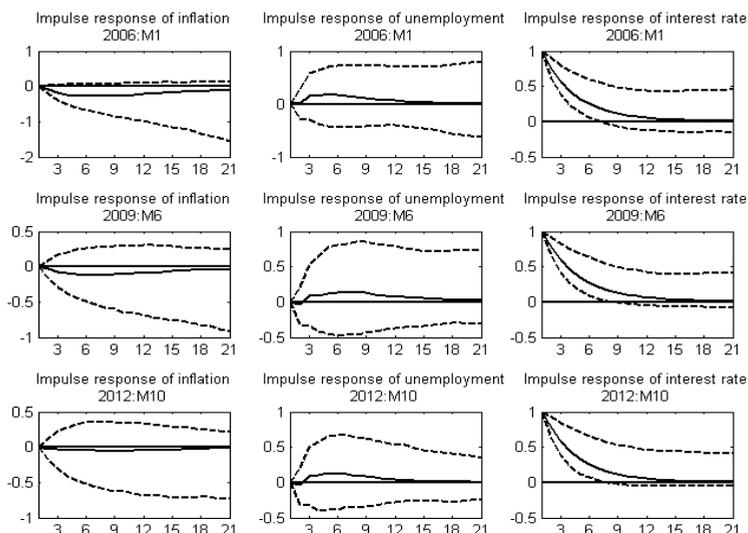
observable components) and the delivered results do not vary too much. Just as Korobilis (2009) mentioned, choosing this number of factors doesn't necessarily mean that there is possible misspecification, since three and four factors perform really well in many empirical applications.



**Figure 1** Cumulative Percentage Variance explained by each one of the 92 factors, sorted in descending order

### 3.3 Impulse response analysis

The measure of non-systematic policy actions is given by the identified monetary policy shocks (fig. 2). The responses of inflation and unemployment rate after a shock in interest rate are plotted. Three points in time are investigated: 2006: M1 (after the adoption of inflation targeting monetary policy strategy), 2009: M6 (during the latest economic crisis) and 2012: M10 (in order to form an image on the current economic situation).



**Figure 2** Impulse responses over a horizon of 21 months, after a shock to Interest Rate, in the three moments in time

It can be seen that after an increase in the level of interest rate, inflation decreases in each one of the three moments of time, which is according to the theoretical view. The response is more pronounced in 2006, which means that after adopting the inflation targeting strategy, monetary policy interest rate was a more efficient instrument. In 2012, after the period of crisis, the impact the monetary interest rate had on the evolution of other economic variables decreased. After several periods of time, the response of inflation dissipates, which confirms the theory regarding the long term neutrality of money.

After an increase in the level of interest rate, unemployment increases. This is according to the theoretical view because investments become less attractive and the costs for the companies to continue with their activity are higher. The response of unemployment dissipates too in time and the differences between responses prove also that the estimated coefficients show time variation.

The response of the interest rate after a shock in interest rate itself has a lower informational content than the rest of the graphs, but what should be mentioned is that the response is seen immediately and not with lags and it is adjusting back to the initial value over time.

#### 4 CONCLUSIONS

In this paper the evolution of inflation rate and unemployment after a shock in monetary policy interest rate is estimated, by using a TVP-FAVAR mode. The conclusion is that responses were more inline with the theoretical view after the adoption of inflation targeting strategy and gradually diminished with the appearance of the crisis. Measures are searched at this moment, at the level of European Union, in order to stimulate the economy, more precisely, the economic growth. As further research, a switching regime model could be estimated.

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## A WAY TO DETERMINE CHAOTIC BEHAVIOUR IN ROMANIAN STOCK MARKET

Emilian Lucian NEACȘU\*, Marcela Daniela TODONI\*\*

**Abstract:** *It is difficult to distinguish between multiple random shocks and endogenous informational inflow in nonlinear systems which show complex dynamics. For this reason, we run the chaos tests to investigate the presence of chaotic phenomena using: nonlinearity tests, Recurrence Plot (RP) and Recurrence Quantification Analysis (RQA).*

*In this paper, we compute the Hurst Exponent using R/S analysis on Romanian capital market for a time span between 2005 - 2014 daily data. Substantial changes of Hurst Exponent behaviour in the current period compared to the previous one may be seen as structural break points in the series.*

*The goal of this paper is to determine time series chaotic behaviour in order to highlight the efficiency levels of CEE markets. Also, we aim to investigate the changes in drifting dynamical systems, to examine the recurring patterns – the most important features of complex systems and to admire the "simple beauty of the complexity".*

**Keywords:** *Hurst exponent, chaotic behaviour, structural breaks, recurrence analysis*

**JEL Classification:** *B59, C61, D53, G01, G14*

### 1 INTRODUCTION

The complex behaviour of financial time series, which linear stochastic models are not able to account for (Mantegna & Stanley, 2000; Johnson, et al., 2003), has been attributed to the fact that financial markets are nonlinear stochastic, chaotic or a combination of both.

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The problem of characterizing financial time series is still an open question. Most of the test developed in the area of economic theory, provide evidence of nonlinear dynamics, which is a necessary but not sufficient condition for chaos. This nonlinearity may be deterministic or not deterministic. In fact, there is no convincing evidence of deterministic low-dimensionality in price series (Scheinkman & LeBaron, 1989; Papaioannou & Karytinis, 1995) and the claims of low-dimensional chaos have never been well-justified. The methods to analyze time series for detecting chaos can be classified in metric, dynamical, and topological ones (Belaire-Franch *et al.*, 2001). Generally the tools used for economic analysis are: BDS test, correlation dimension - metric tool; Lyapunov exponent - dynamical tool and topological tools.

Topological tools are characterized by the study of the organization of the strange attractor and they include recurrence plot. They exploit an essential property of a chaotic system, i.e. the tendency of the time series to nearly, although never exactly, repeat itself over time. This property is known as the recurrence property. In fact, the topological methods preserve time ordering of data, where evidence of chaos is found, the researcher may proceed to characterize the underlying process in a quantitative way. Thus, one is able to reconstruct the stretching and compressing mechanisms responsible for generating the strange attractor. It works well on relatively small data sets, is robust against noise, and preserves time-ordering information (Gilmore, 1993a, b).

From an empirical point of view, it is difficult to distinguish between fluctuations provoked by random shocks and endogenous fluctuations. For this purpose, chaos tests are developed to investigate the basic features of chaotic phenomena (nonlinearity, presence of an attractor, sensitivity to the initial conditions) (Faggini, 2011a, b).

The paper is set up as follows. In section 2 data used are described, and a short characterization of Bucharest Stock Exchange phases of evolution is made. Section 3 investigates chaotic phenomena using: BDS test, Recurrence Plot and Recurrence Quantification Analysis. Further, Hurst exponent computation is used to identify structural break points. Finally, in section 4, we report the conclusions of our work.

## 2 DATA

In order to determine time series chaotic behaviour and to highlight the efficiency level of an emergent European market, we analyse a particular case of the Romanian capital market - the Bucharest Exchange Trading index (BET). The daily closing prices of BET have been selected from [www.quotenet.com](http://www.quotenet.com). The examined time period spans from January 2005 to January 2014 and the number of observations in the sample is 2206.

The main component of the Romanian capital market is Bucharest Stock Exchange (BSE). Under the considered time span, BSE had registered different evolution periods: (i) 2005 - 2007 period is characterised by an uncertainty phase - high volatility and frequently changes in trends; (ii) the occurrence of turbulence phase in the context of international financial instability; (iii) between 2007 - first part of 2009 Romanian capital market registered a persistent down trends and an increase of the market intrinsic volatility; (iv) in the second part of 2009 and the first part of 2010 a new promising uptrend starts, but not in a consolidated manner; (v) from final part of 2010, the actual period is viewed as a range zone without any clear trend direction and high volatility areas.

## 3 INVESTIGATION OF CHAOS

### 3.1 BDS Test

In order to evaluate the presence of long run time dependencies in data we run BDS test which involves a restrictive null hypothesis that the series is independent and identically distributed. The Brock-Dechert-Scheinkman (Brock, Dechert & Scheinkman, 1996) test can be used for testing the *i.i.d.* property of a random walk versus general dependence, which include non-stationarity, linear and nonlinear stochastic system as well as nonlinear deterministic system, which could feature deterministic chaos evolutions.

Less attention has been paid to the appliance of this procedure to highlight the non - random dynamics of the European emergent markets.

Under the assumption of independence in data, this statistic is expected to be close to zero. There are several methods to specify: 1) as fraction of pairs, with being calculated to ensure a certain fraction of the total number of pairs of points in the sample lie within of each other; 2) as fixed value - a raw value specified in the

units as the data series; 3) as a multiple of the standard deviation of the series; 4) as a fraction of the range. We are using the fourth method since the underlying series shifts between a maximum and a minimum value capture by our considered period.

Also it should be noted that if series have unusual distributions, the distribution of the test statistic can be quite different from the asymptotic normal distribution. To compensate this fact, it is necessary to compute bootstrapped p-values for the test statistic.

The bootstraps BDS test values reported in Table 1 shows that the null hypothesis can clearly be rejected with taking into account  $m = 2, \dots, 10$  embedded dimensions.

BDS test incorporates embedding dimension but it assumes only a time delay equal to 1. BDS could not be considered a direct test for chaos. Therefore, the test does not clearly separate the independent and identically distributed patterns, but lead to the conclusion that there are important deviations from the independence in data. Such deviations can assume the existence of some structural changes, which are leading to low-order chaotic behaviours.

### 3.2 Recurrence Analysis

Since BDS test cannot provide sufficient information about the underlying system responsible for chaotic motion, we apply the Recurrence Analysis - a topological approach used to investigate this type of behaviour.

Recurrence Analysis studies chaotic systems because recurring patterns are among the most important features of chaotic systems (Cao and Cai, 2000). It consists of two parts: the Recurrence Plot (RP) developed by Eckmann et al. (1987), a graphical tool that evaluates the temporal and phase space distance, and Recurrence Quantification Analysis (RQA) – a statistical quantification of RP (Zbilut and Webber, 1992). In this paper we used a package called VRA - Visual Recurrence Analysis, created by Eugene Konov.

**Correlation Dimension test** (Grassberger & Procaccia, 1983) is frequently used to distinguish between chaotic and random behavior. A pure stochastic process will spread all space as evolving, but the movements of a chaotic system will be restricted by an attractor. In this case correlation dimension saturate (for delay=27 and max embedding dimension=10) at 3 embedding dimensions, and hence it might be possible to deal with a chaotic system.

To reconstruct the recurrence plot of the entire dynamical system (hidden and otherwise unobservable multidimensional space) from a single time series is realized via embedded delayed coordinates (time delay and embedding dimension). To estimate the time delay is used average mutual information function, which reaches the first minimum - considered optimal time delay - at 27 time lags in our case. The second coordinate is established via the false nearest neighbor method, which considers 10 embedded dimensions.

In Figure 1(a) it can be observe the RP for BET index generated with delay and embedding dimension, both equals to 1. Both RPs displayed in Figure (1a) and (1b) are subjected to a visual comparison. The second plot (1b), based on the 27 time delays and 10 embedded dimensions produce patterns, that are not normally visible in the series and which could provide clues to search for the presence of deterministic chaos. A zoom-in, helps us to observe some parallel lines to the main diagonal, which provides information about the presence of deterministic chaos, and therefore we may carry out a further investigation.

As a consequence of RPs subjectivity and to extent the original concept, in order to make it more quantitative, Zbilut et al. (1998, 2000) developed a methodology called Recurrence Quantification Analysis. In order to study BET series evolution, using RQA method for 27 time delays and 10 embedded dimensions, our sample is split in 9 epochs, each epoch consist in relatively 200 observations (Table 2).

*Percent recurrence* quantifies the amount of cyclic behavior – which in our case is very low (for all epochs recurrence is smaller than 3%), but in the same time recurrence percent are positive, indicating that all data presents low-order correlation. *Percent determinism* is the percentage of recurrence points forming diagonal line structures to all recurrence points, which are parallel to the main diagonal. In the 5<sup>th</sup> epoch determinism reach the highest value (72%), followed by the 4<sup>th</sup> epoch (67.69%), indicating significant deterministic structures in those periods. Higher *laminarity* in epoch 4 (13%) and epoch 5 (27%) implies that the states of the system stay closer in time for longer periods forming vertical structures. Therefore, it can be assumed that higher *laminarity* implies smaller volatilities, while other epochs where *laminarity* reach 0 values, gives us a clear signal of high volatilities. *Shannon entropy* measures the distribution of those line segments that are parallel to the main diagonal and reflects the complexity of the

deterministic structure in the system. Higher entropy ratio values obtained in 4<sup>th</sup> and 5<sup>th</sup> epoch obviously indicates time series structuredness, characterized by periodic behaviors. It is worth mentioning that in the third period, represented by the turbulent phase preceding the crisis, a single 0 value of entropy is obtained, which indicates small diversity, and hence a typical chaotic behavior. *Maxline* represents the average length of diagonal structures and indicates the longest line segments that are parallel to the main diagonal. Higher values of *maxline* in 4<sup>th</sup> and 5<sup>th</sup> epoch represent long line segments which produce periodic signals. While the noise does not produce any segments, the smaller value of *maxline* in the third epoch indicates short segment, and thereby sustains the chaotic behavior assumption. *Trend* value measures the paling of the patterns of RPs away from the main diagonal. The most evident trends registered in epoch 5 (29.12%), followed by the 4<sup>th</sup> epoch (29.53%), confirm the existence of pure deterministic areas. In order to highlight the chaotic behavior manifested in the third epoch we compared these results with those obtained in the 4<sup>th</sup> and 5<sup>th</sup> epoch. Also, after an overview of results, epoch 8 and 9 are subjected to the presence of chaotic features.

### 3.3 Hurst Exponent

In the following, we used a tool for studying long-term memory and fractality of a time series named Rescaled Range analysis (R/S analysis) first introduced by Hurst (1951) in hydrology. Mandelbrot (1983) argued that R/S analysis is a more powerful tool in detecting long range dependence. In this method, one measures how the range of cumulative deviations from the mean of the series is changing with the time. The Hurst exponent is equal to 0.5 for random walk time series, <0.5 for anti-correlated series, and >0.5 for positively correlated series.

In this work we compute the Hurst Exponent using the standard scaled variance method (Cannon et al., 1997) by linear regression of  $\log(R/S)$  versus  $\log(\text{time})$  with *non-overlapping* 5, 10 and 20 days length windows.

As the previous RQA results indicate a substantial change from epoch 3 to 4, this identification of a chaos-order phase can be interpreted as a structural break point in the series. Also, the switch from epoch 5 to 6 may be seen as an order-transition phase, while for epoch 7 to 8 and 9 a transition-chaos period is registered. Results reported in Figure 2 found substantial changes of Hurst

Exponent behaviour at the beginning of the 4<sup>th</sup> period compared to the 3<sup>rd</sup> one. This period represents the transition from the turbulent phase preceding the crisis to the market collapse. Also, Hurst exponent computation for a 5 days window identifies an important shift from the antipersistent value (0.245), indicating high volatility and random behaviour, to a persistent value (0.98). Hurst exponent line values plotted in Figure 2: 0.85 to 0,33 for H5; 0,83 to 0,22 for H10; and 0,85 to 0,33 for H20 confirm the existence of a structural break point that reflects the switch from order to transition phase. The final structural break point identified in H5 (H values from 0.22 to 0.91) and in H10 (H values from 0.39 to 0.94) confirms the passing from transition phase to chaotic areas.

Further, we apply over the estimated series of Hurst exponents the so-called Lo and MacKinlay (1988; 1989) overlapping Variance Ratio Test in order to reveal the degree in which these can be described as random walk processes. This test examines the predictability of the time series by comparing variances of differences of data computed over different intervals.

Three different alternatives are considered: 1) the Hurst exponent series are random walks; 2) these series are assumed to follow an exponential random walk. Firstly, the test is performed for homoskedastic random walks using the wild bootstraps distribution to evaluate statistical significance. Secondly, we are testing for a weakened version in which the data can be described by a heteroskedastic random walk. Such hypothesis allows, for more general forms of conditional dependence, to be a martingale difference sequence.

The *Variance Ratio* tests reported in Table 3 reject the random walk null for two tested forms of data frequencies. The same results are obtained if the martingale null is considered, thus both homoskedastic and heteroskedastic assumptions are rejected for the first and the second tested forms.

#### 4. CONCLUSIONS

The appliance of BDS test rejects the null hypothesis of independent and identical distributed prices evolutions. Testing BET index series using recurrence analysis indicates the presence of chaotic motions in areas where market characteristics have changed. Such results are confirmed by the non-uniform behavior of Hurst exponent, which confirms the existence of structural break points in those areas.

Overall results are leading to the conclusion that the identification of structural break points in the BET index appears under the impact of fundamental changes in market mechanisms and produce persistent effects.

Evidence of chaotic behavior is found in Romanian stock market only in two specific periods: the turbulence phase preceding the crisis and the outbreak of the financial crisis. Those structural shifting areas evolve as a consequence of structural changes in institutional and functional architecture.

### ACKNOWLEDGEMENT

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## ANNEXES

**Table 1** BDS portmanteau test for BET index (Raw epsilon: 6248.515)

Dimension	BDS Statistic	Std. Error	z-Statistic	Normal Prob.	Bootstrap Prob.
2	0.011195	3.22E-05	347.2489	0.0000	0.0000
3	0.022414	7.12E-05	314.6108	0.0000	0.0000
4	0.033583	0.000118	285.0368	0.0000	0.0000
5	0.044664	0.000170	262.0306	0.0000	0.0000
6	0.055657	0.000228	244.0110	0.0000	0.0000
7	0.066557	0.000290	229.5391	0.0000	0.0000
8	0.077350	0.000355	217.6154	0.0000	0.0000
9	0.088037	0.000424	207.6132	0.0000	0.0000
10	0.098614	0.000495	199.0820	0.0000	0.0000

Source: Authors results

**Table 2** Recurrence Quantification Analysis results

Epoch number	1	2	3	4	5	6	7	8	9
Start point	1	201	401	601	801	1001	1201	1401	1601
Mean	5644.297	7619.601	8858.438	8414.204	3891.684	4015.367	5259.097	5527.528	4734.512
Standard deviation	623.620	481.784	694.723	1240.479	1618.904	712.753	363.847	327.138	384.250
Mean rescaled dist	100.001	99.999	100.000	100.000	100.000	100.000	100.000	100.000	100.000
Percent recurrence	1.307	0.357	0.704	2.131	2.261	0.688	0.613	1.161	0.920
Percent determinism	56.154	14.085	26.429	67.689	72.000	31.387	23.770	50.649	46.995
Percent laminarity	0.000	0.000	0.000	12.972	26.667	0.000	0.000	0.000	0.000
Trapping Time	-1.000	-1.000	-1.000	5.000	5.455	-1.000	-1.000	-1.000	-1.000
Ratio	42.979	39.476	37.566	31.769	31.840	45.591	38.773	43.633	51.103
Entropy (bits)	2.842	0.000	1.459	2.350	3.161	1.792	1.522	2.020	1.950
MaxLine	15	5	9	104	61	10	7	12	10
Trend	-23.969	-6.560	-12.944	-39.008	-41.316	-12.638	-11.245	-21.307	-16.895

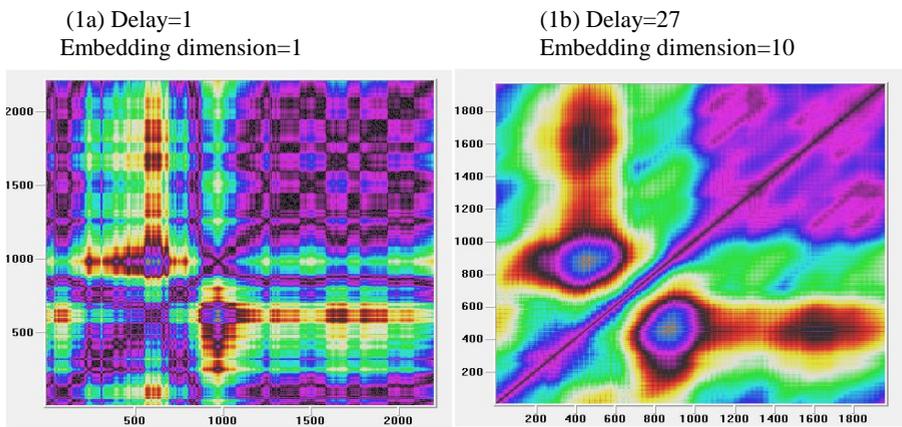
Source: Authors results

**Table 3** Lo-MacKinlay VR Test for the Hurst exponent series using rank scores –  $H_0$ : Random Walk and data levels –  $H_0$ : Martingale

	<i>Null: Random walk</i>		<i>Null: (Log)H are RW processes</i>		<i>Null: Martingale</i>	<i>Null: (Log)H are martingale</i>
	Max  z  (at period 2)	Wald Chi-Square	Max  z  (at period 2)	Wald Chi-Square	Max  z  at period 2)	Max  z  (at period 2)
H5 days	10.93 (0.000)	119.79 (0.000)	10.92 (0.000)	120.10 (0.000)	8.67 (0.000)	7.63 (0.000)
H10 days	8.45 (0.000)	74.53 (0.000)	8.53 (0.000)	76.28 (0.000)	7.55 (0.000)	6.81 (0.000)
H20 days	5.28 (0.000)	28.09 (0.000)	5.30 (0.002)	28.32 (0.003)	4.80 (0.001)	4.46 (0.008)

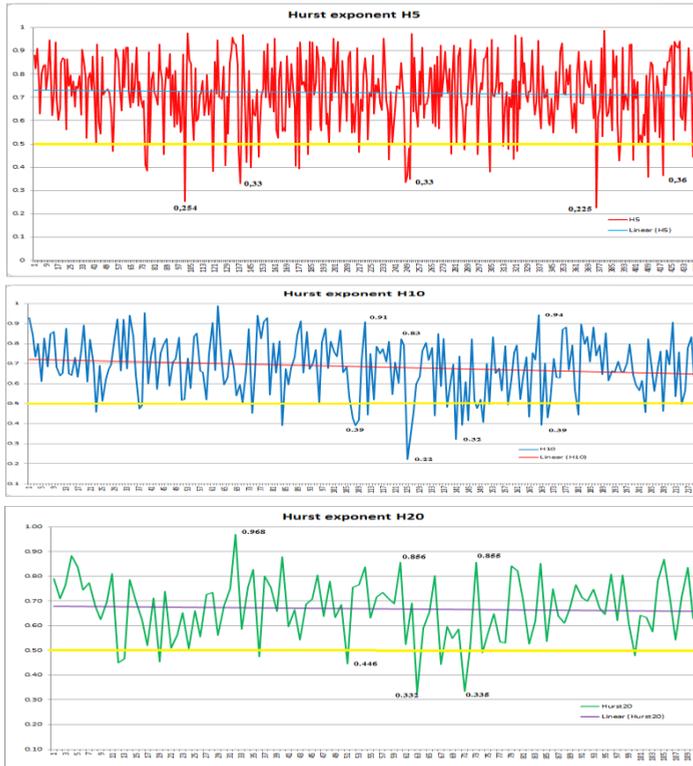
Probability in ()

Source: Authors results



**Figure 1** Recurrence Plots

Source: Authors results



**Figure 2** Non-overlapping Hurst exponent on 5, 10 and 20 days length windows

Source: Authors results





## TOWARDS A EUROPEAN BANKING UNION: RISKS AND CHALLENGES

Vasile COCRIȘ\*, Igor ȚURCANU\*\*, Stanislav PERCIC\*\*\*

**Abstract:** *Economic instability and financial turbulences in the European Union and especially in the Eurozone over the past years have given rise to calls for a real solution in order to solve the problems of the current crisis. In an integrated monetary area, economic and financial stability are issues relating to collective responsibility. That is why, when trying to deal with the latest challenges, the European Commission has proposed to establish a more unified banking supervision mechanism in the form of a banking union, which will fall under the auspices of the European Central Bank. Although the current banking union proposal seems to be a critical step towards solving the on-going crisis, there are many risks and challenges that the European Union has to deal with. This study aims at bringing together different views in order to highlight strengths and weaknesses of the future banking union. The body of this paper hosts a detailed description of the proposed European banking union, offering valuable insights, recommendations and some proposals for a way forward.*

**Keywords:** *banking union, banking supervision mechanism, Eurozone, European Central Bank*

**JEL Classification:** *E58, F33, F36, F55, F63, G21*

### 1 INTRODUCTION: RATIONALE FOR A BANKING UNION

In the context of the current economic instability and financial turbulences, the European Union and especially the Eurozone is facing numerous problems related to the banking sector:

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- *Increase of non-performing loans of banks (NPL)*: the number of non-performing loans alarmingly increased during the last 5 years especially in the PIIGS countries (Portugal, Ireland, Italy, Greece, and Spain). According to Ernst & Young (2012), the total volume of NPL corresponds to 9,5% of the GDP in Eurozone.
- *The disproportionality of banking sector in some member countries*: the last financial turbulences have shown that some Eurozone members have a much too large banking sector or, moreover, have a business model limited only to the banking sector (ex. Cyprus, Malta, and Luxembourg).
- *The risk of “spill-overs” and contagion*: there seems to exist significant “spill-over” effects regarding the credit expansion (Apostoaie and Percic, 2013).
- *High public debt due to bank bailout (the vicious circle around sovereign debt and bank debt)*: the net cost of bank bail-out programs are reflected in cumulative increase in the national debt by 2012 to 520 billion euro in the Eurozone (Breuss, 2013).

Taking into consideration the latest challenges regarding financial and especially banking aspects, the European Union has given rise to calls for a real solution in order to pass through this unstable period. The idea of a *banking union* came as a “tailor made” life buoy for the entire European Community.

## 2 EUROPEAN BANKING UNION STRUCTURE

European representatives and policymakers recognized the weaknesses in the institutional framework of European banking markets and made a decision to create a new architecture for the European financial markets.

Since the creation of the European Union, its' institutions were designed taking into consideration a version of the liberal dogma of “putting the house in order”. According to this, it would be necessary and sufficient if every member state individually were to discipline its public finances and banking system for the whole system to function efficiently based on market competition (Zavvos, 2013). Thus, the architecture of European financial markets has rested on the principle that control and liability remain at the national level. However, as the crisis has highlighted the risks associated with national supervision, policy efforts aim at centralizing competencies and institutions at the European level. In this context, the European Banking Union is called to propose a new centralized institutional architecture, centered on four interrelated pillars:

1. A “single rulebook”;
2. A single supervisory mechanism (Single Supervisory Mechanism - SSM);
3. A single resolution regime (Single Resolution Mechanism - SRM);
4. A financing regime for bank failure (Single Deposit Guarantee Mechanism - SDM).

These four building blocks were divided into two sections, the first is preventative and the second is remedial, highlighting the logic and unity of banking union:

- The *preventative section* covers the mechanisms designed to reduce the probability and severity of banking crises (a single rulebook and a single supervisory mechanism).

- The *remedial section* encompasses the mechanisms designed to protect national public finances from the consequences of bank failures by creating a European firewall: single resolution regime and financing regime for bank failures.

The *first pillar* of the banking union consists of a “*single rulebook*” for the banking sector. The use of the same rules of the game to compete on the European market is an essential condition for the integration process. Thus, this single rulebook will be implemented, through the *Capital Requirement Directive CRD IV*, the new bank liquidity and capital requirements established by the Basel Committee (Basel III). The responsible institution for developing this fundamental pillar is the European Banking Authority (EBA).

The *second pillar* consists of a common supervision mechanism for banks (*Single Supervisory Mechanism - SSM*) headed by the European Central Bank (ECB). Between the birth of the euro and the outbreak of the financial crisis, the development of cross-border interbank operations has increased the integration of financial and banking markets. This growing integration has helped improve the transmission of the single monetary policy, but, at the same time, the threats that banking troubles have created for the stability of the region as a whole justify the centralization of supervisory functions with a single authority, rather than leaving them in the hands of national authorities. Since the ECB is the only European institution not directly subject to political power, it has been decided to attribute this mission to this financial actor. Thus, the ECB must supervise all the credit institutions in SSM-member countries and will have direct supervisory powers over the largest banks that meet any of the following criteria:

- assets over 30 billion euro;
- represent more than 20% of national GDP, unless total assets of that bank amount to less than 5 billion euro;
- be among the three largest banks in the member state concerned.

According to these criteria, it is estimated that around 130 banks accounting 80-85% of Eurozone total bank assets will be under direct ECB supervision (Speyer, 2013). At the same time, the EBA will become the standard-bearer for supervision practices within the European Union.

The *third pillar* of the European Banking Union is represented by a common resolution mechanism at the EU level (*Single Resolution Mechanism - SRM*). This mechanism, proposed by the Commission, is a single orderly liquidation mechanism that would set the rules for bank resolution and allow the coordinated application of resolution instruments to nonviable failing banks within the banking union. Bank supervision alone is not enough without a resolution mechanism. The supervising authority must have the power to order a bank to be shut down, a responsibility that must be assigned to a distinct authority. A bank resolution scheme seeks to split losses between shareholders and bondholders under a so-called “bail in” whilst preserving the systemic functions of the bank and liquidating its non-viable activities.

The SRM proposal suggests the following institutions (and governance) at European level:

- *Single Resolution Board* – a special European Union agency that will require, review and monitor resolution planning by all banks subject to the SSM;
- *Single Bank Resolution Fund* - will be set up under the control of the Single Resolution Board to provide the medium-term funding support for the banks that are under restructuring.

The *fourth* and the last pillar of the banking union must consist of a common deposit guarantee scheme, which will prevent banks from depending in the last resort on the sovereigns, thus breaking the vicious circle between banking crisis and sovereign debt crisis (*Single Deposit Guarantee Mechanism - SDM*).

### **3 RISKS AND CHALLENGES OF THE EUROPEAN BANKING UNION**

The European banking union is seen differently by the EU member states: some of them find banking union as a relatively cheap and efficient alternative to settle their

unstable banking systems without losing sovereignty over financial supervision, others see this European project as a promising lever to prevent and control the economic behavior of deficit countries. Nevertheless, EBU is perceived as a real “panacea” for the current unstable situation. However, given the current status of the EBU, we must understand that it is not even close to a perfectly functional solution and, what is even more important; there are several risks and challenges that will fortify or, on the contrary, break down this ambitious European project.

The first and main challenge of the EBU is *to break the vicious circle between banking crisis and sovereign debt crisis* (Figure 1). The EBU has the mission to loosen the links between banks and states that are one of the main sources of vulnerability and financial instability at the level of euro zone. As the last decade showed, most banking crises were dealt with at national level, and involved huge fiscal burdens for the taxpayers. For instance, in the case of Ireland, due to the high level of capital injections needed (amounting to 43% of GDP), the bail-out of its financial system threatened the collapse of the national public accounts (Sicilia, de Lis and Rubio, 2013). Another good example is the case of Greece: although the Hellenic banking sector was not particularly weak, the fact that it held Greek government debt on its balance sheets, together with the unstable economic situation, generated a cocktail that has required a recapitalization of the country's financial system. Now, the EBU is called to break this vicious circle and to restore the financial stability within the European Union (Schoenmaker and Siegmann, 2013).

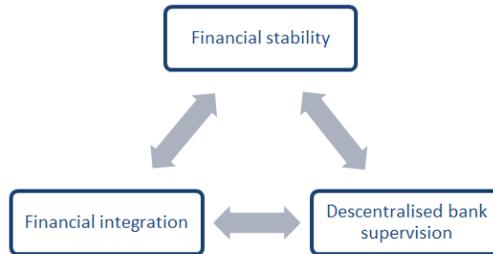


**Figure 1** The vicious circle between banking crisis and sovereign debt crisis

**Source:** Own representation after Herring, 2013, p.12

In the context of financial crisis and deeper European integration, the EBU is called to face an additional challenge: *the triangle of incompatibility* or *the trilemma of financial supervision* (Figure 2). As the last decades demonstrated, the

EU member states neither want to completely forsake the benefits of integrated financial markets, nor truly transfer power over their national financial markets and financial institutions to the supranational level. The EBU is facing a real difficulty of reconciling a single financial market and financial stability with decentralized supervision conducted by national authorities.



**Figure 2** The trilemma in financial supervision

*Source:* Schoenmaker, 2005, p.397

Therefore, the European community should argumentatively advocate for centralised supervision (Ubide, 2013), which at first glance seems to be the perfect solution to override the impossible trinity. Despite the fact that the central supervisor will have a real information advantage over national supervisors in the case of institutions that are active across several member states, European experience tends to suggest that small and mid-sized banks are frequently sources of financial instability, particularly due to the strong correlation of risks between them. Thus, the SSM *de facto* will create a two-tier supervisory regime, as small banks will remain under the supervision of National Competent Authorities. There is a risk that the ECB will not seek or will not obtain direct supervisory powers over an ailing small bank until it is too late. In addition, member states might have an incentive to shift competence to the ECB when trouble is imminent. Moreover, in virtue of the Treaty on the Functioning of the European Union (TFEU), the ECB cannot exercise coercive powers outside of the Eurozone. Consequently, EU member states who are not members of European Monetary Union (EMU) cannot fully participate in this mechanism.

With regard to the above-mentioned trilemma, it is worth mentioning that in the absence of perfect economic and financial integration between member countries, a *banking union creates externalities* that require transfers between

member countries during severe circumstances, such as asymmetric shocks, in order to offset the fact that they can no longer adjust exchange rates.

In another train of thoughts, it must be noted that there may be *conflicts of interest between the conduct of monetary policy and of supervisory roles within the same institution* - ECB. On the one hand, an increase in interest rates would help ensure price stability but, at the same time, it could lead to the failure of one or more of the banks under supervision. On the other hand, the European community made a call for a new anti-crisis management tool – the bail-in (Quignon, 2013). This tool aims at recapitalising banks in financial distress through forced conversion of debt claims into equity and/or the transfer of doubtful loans and capital to a defense structure. In the case of a bank failure it is highly likely the ECB will be among the creditors of this institution on account of normal monetary policy operations.

Focusing our attention on the proposed *bail-in tool*, we should underline its *real effects on depositors' behavior*. Firstly, the depositors will probably react more quickly and promptly to negative news and will be assisted by a heightened apprehension about the stability of individual banks or banking systems. Secondly, individual and corporate depositors will seek to limit their exposure to a possible bail-in (Speyer, 2013). Specifically, this would lead to individuals and corporations limiting the deposits held in any bank to the insured amount (or even less) and investing funds in assets other than deposits. In sum, this would obviously have repercussions on banks' refinancing situation.

#### **4 CONCLUSIONS, RECOMMENDATIONS AND FUTURE DIRECTIONS OF THE RESEARCH**

In the current economic context, the European Banking Union seems to be the most suitable and natural solution to override the financial instability within the Eurozone. On the one hand, through a preventative section of measures, the EBU provides suitable mechanisms to reduce the probability and severity of banking crises. On the other hand, through a remedial section, the EBU offers valuable mechanisms designed to protect national public finances from the consequences of bank failure.

However, the EBU is not even close to a perfectly functional solution and this study highlighted the weaknesses of the future banking union. The authors

raised the discussion on several risks and challenges that will fortify or, on the contrary, will break down this ambitious European project.

*Firstly*, the EBU will have to break the vicious circle between banking crisis and sovereign debt crisis, thus partially solving the problem of financial stability within the Eurozone. *Secondly*, the EBU will have to pass through the trilemma in financial supervision and to establish an effective banking supervising mechanism, thus providing a rigorous and unbiased assessment of bank soundness and financial stability. *Thirdly*, the EBU will have to mediate the conflicts of interest between the conduct of monetary policy and of supervisory roles within the same institution – ECB. This is not an easy mission, but we have many examples of good practice from the central banks all around the world, where the staff in charge of supervising functions is attached to a distinct structural entity that is physically separated from other services.

These are just a few challenges that the future banking union will be faced with, but they represent just the tip of the iceberg. The present research paper is a cornerstone for a future complex diagnostic study of the upcoming banking union.

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SURVEY ARTICLE

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# CO-PRODUCTION THE PUBLIC SERVICE – A PARTNERSHIP STRATEGY FOR QUALITY INCREASE

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**Abstract:** *The concept of co-production of the public service caught the attention of public authorities starting with the 80s when the paradigm of the new public management was extended. This notion involves the participation of citizens together with competent authorities in the entire process entailed by the public service: from planning to implementation and feedback. Thus, the citizen becomes a co-producer or even producer of added value.*

*This article reviews how this concept has been approached in the scholarly literature until now, the mechanisms involved, its advantages and disadvantages, especially in the public sector. The theoretical approach is supported by several examples from practice.*

**Keywords:** *co-production, co-production process, citizen, consumer, public services*

**JEL Classification:** *H83, M30*

## 1 INTRODUCTION

### 1.1 A Short Definition

The term of service co-production indicates by itself the involvement of multiple partners and the common effort necessary for its producing, as well as for its sustainability for the sake of its beneficiaries. Co-production is, instead, a closer concept, which according is defined as: „a form of cooperation in production which is established between governments or enterprises in different countries in order to manufacture together a product (DEXonline, coproductie)” and the best known form of co-production is that of cinema production.

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## **1.2 Co-Production of Products and Services. Examples for Understanding its Process**

In everyday life, we find ourselves in diverse, formal or informal situations as citizens or co-producers: for example, we embrace our duty as a tenant to sweep the snow in front of our block of flats; we involve ourselves personally or our own children in voluntary activities to reforest the devastated regions around towns. In other words, we respond to the needs of the community we live in, spurred on by the appeals of the public authorities who offer us the chance to voluntarily take part in their roles and responsibilities for our common good. This is a form of rendering the costs as efficiently as possible by their partial transfer to citizens, or as the case may be, to the client (the latter accepts and takes on the required tasks voluntarily, committing him/herself in this way to a decision taken according to his/her preferences, cf. Etgar, 2008). Nevertheless, this involvement of the citizen or client is supervised by the authorities who control, delineate and manage the framework for the development of the entire process (the creation and maintenance of the partnership, its unfolding, and output evaluation). At the same time, there is a reshaping of social roles, the beneficiary being empowered to participate in the co-production or co-execution of public services on the basis of an implicit recognition of his/her competences which are required in this context.

Lately, this form of public government (in the public sector), as well as an innovative and efficient strategy of attracting business clients has been used in many instances:

In Spain, a restaurant supports the unemployed by offering them a free meal in exchange for an hour of work. Clients can take part in customer serving, dish washing or cleaning ([www.adevarul.es](http://www.adevarul.es), Andrieş, 2013). Apart from straightforward effects – covering their food needs, this type of initiative contributes to the improvement of the psychological state of the unemployed involved in service co-production, making them more confident, optimist and helping them to in touch with people who share their burden. The restaurant, part of a social organization, provides these social services (half of the tables are reserved for the unemployed) based on a “work exchange program”, a partnership with other thirty charitable organizations and with the local council.

In the Romanian health care system, the co-payment system is also an example of service co-production (albeit forced as it is imposed by law) that helps

the system to function for the benefit of all citizens and it means “the contribution of the insured to the health system, collected additionally compared to the one funded by the common national fund of health insurance”. Due to lack of funds, some Romanian hospitals collect fees (receipt-based) from patients to maintain the wards clean.

Another example in Romania is the involvement of citizens in the issue of stray dogs maintenance. On one side, the authorities have let these dogs free on the streets, after these have been castrated and ear tagged, counting on the support of the citizens in areas where dogs have been kept to be fed. Co-production is in this case is implicit (informal and steeped into ethical interrogations) because citizen were not officially invited to participate in providing the public service that should have been provided by local authorities who have the necessary funds; on the contrary, the authorities counted on feelings of pity and good will of citizens towards animals. The call of authorities to citizens to adopt dogs (take them home or pay for their expenses and upkeep in the specially made paddocks) is part of a process of co-production the public service in which the citizen becomes an active partner in the management of this issue.

Other examples can be found in the Romanian education: class fund collection in primary, secondary schools and even high schools, through which pupils (through their parents) contribute with funds to the upgrade of classrooms as to provide a better environment for delivering educational services. Likewise, the students’ involvement in research projects and their presentation in class (at the initiative and under the supervision of their professor) is another example of educational service co-production. Waste collection voluntary programs in some regions in which pupils and students are involved is also a form of “co-production” of environmental protection service.

Moreover, we can also include here people who are on social benefits and who have to provide community services for free. These not only provide the service and also benefit from these services as community members.

But this practice is not limited to the public sector.

Another restaurant also from Spain, for example, provides to clients the opportunity to pay for the services as much as they like, according to their ability (and integrity) to estimate the cost of service ([www.adevarul.es](http://www.adevarul.es), Gherman, 2009). Besides the marketing strategy of the restaurant owner, through which he tried to

save his business from failure during recession, this case illustrates the co-production of a service where the consumer is an expert in establishing the price of the menu.

The retail field provides many similar examples, for example, “Carrefour” involved its clients in testing its products: “Inspired, tested and approved by Carrefour’s clients®”, according to the principle “those willing, from the most diverse social categories, can become involved directly by suggesting new products or, on the contrary, by improving those that already exist” ([www.brandprivat.ro](http://www.brandprivat.ro), 2013). The company gets new ideas for new products or eliminates those that are not seen as being efficient. The involved client will be more tempted to buy the “created” product, and, on the other hand, the retailer will have more chances to have faithful clients.

### **1.3 The New Paradigm**

The co-production is the new paradigm of the private sector (a source of inspiration also for the public sector) that ensures the interaction between companies and their clients. The paradigm functions on the service-dominance logic (Casia&Magno, 2009) whereby the consumer is the creator of value precisely because the company provides to him necessary resources for this kind of creation. But sometimes the company has the opportunity to become a value co-creator, along with the client (*idem*).

This strategy has multiple advantages: it diminishes the risk of selling unwanted products, and implicitly, the decreases the costs (on one hand, the specialists who provide free ideas are the clients, and on the other hand, no product is left on the shelf that would not be sold instead of products demanded by the market). A supermarket or hypermarket consumer is also a part of a service co-production process when, in order to recover the coin inserted in a trolley, he/she must take it to its initially allotted place. Naturally, this should be done by an employee paid by the store. Nevertheless, this practice constitutes an advantage for the consumer by disciplining him/her and by offering the possibility for other consumers to enjoy a better service and find more easily a shopping trolley. On the other hand, trolleys are not abandoned in the parking lot, which would cause great discomfort and potential danger for consumers who are trying to park their cars. Other examples of service co-production appear when we ourselves weigh the

products in the supermarket (usually fruits and vegetables, but not only these), or when we ourselves fuel our cars in the gas station.

A tourist in a guest house can be a co-producer if he/she gets involved in the menu preparations for the tourists that are lodged there, and that would benefit both him and the owner.

This article will refer to what is called the “institutionalized” co-production of public service, a method proved to be functional and very useful for providing public service at the highest standards of quality.

A definition of service co-production displaying a certain degree of adaptability to all fields of activity (public and private) is suggested in the works of Michael Etgar (2009). The author applies this concept to marketing and defines it as the participation of the consumer in all value creating activities carried out to obtain high quality products and services. These activities include processes of production and distribution that sustain product manufacturing and service delivery for the target segments of consumers. More precisely, these activities range from intellectual work needed to start and design the process, accumulation of resources, processing that lead to out-puts that later would provide the basis for delivering value “used/consumed later” by clients, up to providing the consumption *per se* (Etgar, 2008, p. 98).

Although, the authors (Vargo& Lush, 2008) make a distinction between the concept of value co-creation (taking place at the final stage of service use/consumption) and that of co-production, which is a component of the first (an intermediary stage within the process), our analysis will disregard this aspect and will focus on co-production.

## **2 CO-PRODUCTION OF THE PUBLIC SERVICE – THE CONCEPT, PRINCIPLES AND ADVANTAGES**

### **2.1 Co-Production of the Public Service – a Partnership with the Citizen**

The concept of public services co-production means the contribution of service user, beneficiary to the process of its delivery (Bovaird&Löffler, 2012).

Public service co-production includes a wide range of options – from the involvement of the consumer/citizen into service planning, design, effective implementation and control over service delivery results to voluntary work.

In order to avoid any controversy tied to philosophy of this process, it should be underlined that public service co-production does not mean to transfer the entire process unto the shoulders of the citizen, who just a user or beneficiary; on the contrary, it means an effective co-working of the two partners – the citizen and public authorities so as to offer a better service, more adapted and in tune with the demands of the community. The citizen is a consumer, but also a participant in service delivery. The consumer is highly valued and is a partner with public service provider due to the fact that the consumer possesses knowledge that professionals lacks, the former being in this way an innovator; the consumer also influences the efficiency of service through the way in which he relates to demands and their monitoring (it is a key factor of success), provides resources on time, information and financial data to increase the quality of his own life and of the others (being a resource); the consumer offers his abilities and talents to professionals (being an asset holder) and finally, the consumer is involved in collaborative relations with the staff or personnel, other users and other citizens (being a community developer) (Bovaird&Löffler, 2012).

The principles (Löffler, Governance International, 2009) on which stands the co-production process confer to the citizen/service the quality of being a holder of assets and not a passive consumer; this should have collaborative, not paternal, relationships with the personnel. The focus should be on results and not on the “service” *per se*.

A paraphrase of the well-known slogan “Our client is our master” becomes an undisputable reality due to the fact that the involvement of the citizen leads to the improvement of public service quality through his expertise; differentiated and diverse services can provide more choices, force public service providers to be more open to the demands of citizens and lead to cost cuts (Bovaird&Löffler, 2012).

Stephen Buetow (1998) investigates medical service co-production through the involvement of patients in the check-ups with the health care using their rights, responsibilities and preferences. In his view, medical service and check-ups co-production takes place because “the recognition, problems and needs management require both contribution of the patient and the health care professional at the same time”. The patient comes with “the manner and attitude, information and preference”, and the professional with the technical knowledge. The partnership between patients and professionals consists in “their reciprocal participation,

responsibilities and decision-making sharing”. The patient has both rights, but also responsibilities (protection the rights of other of others and taking responsibility for the level and nature of involvement).

This form of co-production in the health care system transforms the medical service consumers from “outsiders”, who traditionally took part through their choices of medical service and by voicing their own opinions, and generally by having a “voice” with regard to the priorities, the development and the quality of the service in question (Dunston & al, 2013, p. 46). The consumers become “insiders” enter into the space of medical service production, space that in the past belonged exclusively to professionals. Co-production introduces another type of engagement between the medical service consumer and the health care system, it changes “its location, status, and role [...] during the process of product/service development” (Dunston & al, 2013, p. 46): it is, therefore, another form of partnership – a partnership of dialogue and learning (idem).

Studies show that this process positively influences the consumer’s satisfaction by his perceived control over the process (Araujo Pachéco, Lunardo and Pizzutti dos Santos, 2013). This is mainly an effect of the principle of “service-dominance logic”.

However, the highest risk (or the highest responsibility) is taken by public authorities having the mission to manage the co-production process: to identify services which can be included in this process, to prepare categories of citizens who would be able to get involved, to set skills, limitations of these interventions, feedback, to take responsibility for the results and to design corrective measures.

Joshi and Moore (2004) introduce the concept of institutionalized co-production which, unlike the simple, generally used term, means a long-term, regulated partnership between state agencies and organized groups of citizens for the well functioning of public services, each of the partners “contributing with important resources” (p. 40). The emphasis is places on long-term partnership that can also unfold on the basis of certain informal, undefined arrangements, and which are negotiable “almost continuously”. In their analyses regarding the institutionalized co-production services in poor countries, the above mentioned authors (pp. 31-49) underline that power, authority and the control of resources become shared between state authorities and groups of citizens which participate in the co-production process; this sharing is not necessarily equal, but “interdependent

and ambiguous”. Although seemingly negative, this situation represents the only solution for providing the public service. For the two authors, co-production is the result of “the imperfections and incompleteness of the state” and there are two important factors that can engender it: “governance”, that is the governmental inability to run efficiently the service for certain categories of citizens; and “logistics” (p. 41), that is the fact that state agencies can not provide the service because of certain factors that may be considered “natural”, of a variable and complex environment (for example, the physical distance which is too long for arriving to certain country-side regions and the huge costs required for rendering the service to numerous poor households).

## **2.2 The Advantages of Public Service co-Production**

The general advantages of this strategy for providing public services are multiple and worthy to be taken into consideration:

- Authorities are forced to take into account the reaction of citizens to changes and transformations, a citizen who is more educated, more demanding, full of various expectations, aware of his/her worth and of the power of his/her “voice”;
- The message that the authorities address to the citizen is that “we care about you” or “we are a team”, message that indicates the moral values which should be fundamental for providing public services;
- An intense closeness and empathy towards certain categories of citizens (co-producers) through a dialogue focused on their needs, on the elimination of barriers between the establishment and the co-producer;
- A realist intervention of authorities according to needs of the citizen, avoiding thus potential critics for a service which might have been perceived by the citizen as disproportional, not useful, efficient, or even non-viable and, therefore, discarded;
- Increase of the degree of efficiency, obtained through distribution of (financial, human) resources, efforts, competences, time needed for solving a particular problem (needs);
- A clear improvement of the service through new ideas, new services identified by co-producers;
- Creation of a long term partnership which can save resources in solving similar problems (gain of experience);

- Impelling the co-production citizen to participate in the decision-taking process along with authorities, any time this kind of need arises;
- Gaining stronger involvement of the co-production citizen in the decisions made by authorities through his/her involvement in the decision making process, and increase of the citizens' trust in authorities;
- Avoidance of enacting other laws and the application of those laws which refer to the consultation and involvement of the citizen;
- Improving the image of public authorities due to promotion of participative leadership;
- Creation of certain "social clusters" which stock the potentially creative and innovative energies of citizens that increase their quality of life by means of physical and psychological recovery, increased self-confidence and usefulness to society.
- Obtaining a real feedback, in real time, from beneficiaries of service and the community in general;
- Prevention of "social accidents" among citizens, as for example suicide among the unemployed, drugs consumption among youngsters, etc. by offering them the opportunity to understand it, the risks and by giving them the chance to improve their self-confidence etc.

### **3 KEY STAGES IN THE IMPLEMENTATION OF PUBLIC SERVICES CO- PRODUCTION PROCESS**

The model of the co-production process developed by Michael Etgar (2008), who takes into account the differences between the concept of value co-creation and value co-production, presents multiple stages: *providing of certain a priori established conditions* (macro-environment conditions, cultural preconditions, technological changes, consumer-related factors, product-related factors, situational factors); *the development of factors that generate the consumers' motivation to engage onto the process* (economic factors, the degree of personalization and differentiation of their preferences, psychological motivations, social benefits); *the estimation of necessary costs and cost-benefits ratio of the co-production process* (economic and non-economic costs); *activation* (the consumer's choice of the level or the stage of the process in which he/she wishes to take part – consumption, distribution and logistics, set up, production/construction,

design, initiation); *out-put generation* (benefits gained by users) *and the evaluation of results*.

1. The correct and deep analysis of services which can be “co-produced”, the analysis of reactions, of the level of understanding for the service need by the citizen invited to take part in this service (avoidance of the feeling that the citizen has over-debts, that on his shoulders lands a heavy weight placed there by authorities because the latter do not have the necessary resources or are simply incompetent)
2. Seeking for allies and forming key-partnerships that will support the co-production process (including administrative partnerships which will manage the resources)
3. Creation of mechanisms necessary for the co-production process (setting up communication channels, specific organizing structures, allocation of resources)
4. Education the citizen by raising his/her awareness that he can participate in the entire process by providing information on the advantages
5. Changing the reactive attitude of the obeying citizen, who waits for things to be done by others, into an active attitude of a citizen who has the legal right but also the moral obligation to intervene
6. Analysis of the advantages, qualities, competences that can be offered by each participant to the co-production process
7. Clear presentation of competences that should be offered, as well as their limitations, and negotiation of risks between partners (with the aid of specialists)
8. The authorities should undertake the role of a leader, who provides expertise, moral and operational example, resources, guidance support, and monitoring
9. Continuous evaluation by the authorities of the results obtained in the process of public services co-production
10. Creation of a culture of the co-production process (the promotion of a set of values, norms, symbols, slogans, ceremonies/events)
11. Rewards for participation (recognition of the merit of the co-producer-citizen, dissemination of the process and results)

#### 4 CONCLUSIONS

Co-production of services is inherent in countries that still undergo reforms of consolidation of public administration in order to improve services and increase the degree of satisfaction of its citizens. Numerous factors determine and encourage the implementation of this strategy (Löffler, Governance International,

2009, pp. 2-3): the technical innovations that provide the service user with a greater power of control; the change of their attitude and behavior due to rapid, deep and important changes in the values of modern societies; demographic changes which show that the elderly incline to get involved in the unfolding of public services once the demand for social services starts to grow; the fiscal constraints that become stronger and stronger and the orientation towards results shown by public agencies in some countries (as for example, in the UK).

The concept of public services co-production is not new, and still it is not largely implemented in the public sector of many countries, at least, in Eastern Europe, and implicitly in Romania, where it is even less spread. And this situation tends to persist even though the beneficial effects of this strategy have already been proven in time by modern administrations that have used it intensely in order to improve the quality of their services.

Obviously to be put into practice, the co-production process needs a subsidiary one which sustain its promotion and efficiency. On the one hand, there is a need for the consolidation of a supportive, legislative framework which would regulate the participation of service users under conditions of efficiency and minimization of all risks, creation and maintenance of partnerships, allocation of public resources, along with legislation that would allow citizens to get involved in the decision-making process of authorities.

On the other hand, it is necessary to produce the institutionalization and the creation of a real culture of participation of citizens, their “education”, so as to develop their active attitude, and make them participate more in the unfolding of the public service that concerns them. Citizens should be encouraged, institutions should help them in establishing a feeling of trust and a conviction that they are really taken into consideration, that public services can be personalized or adapted to their preferences on the basis of their direct contribution, and that their abilities, knowledge and time are valued, appreciated and used in their own interest.

Any co-production process brings advantages, disadvantages and risks that must be made known to the potential partners-beneficiaries, in order to gain their trusting participation, to convince them to be part of the “institutionalized co-production networks”, but also to stimulate their creative potential and their involvement in the discovering of new areas or solutions of improvement of the public service quality.

A fundamental question is whether there is an organizational culture inductive to this kind of strategy in the public administration of Romania that would support the co-production processes and be based on vision and be open to treat the citizen/the service user as an able partner, with full rights in the decision-making process and be managed by authentic leaders, capable of identifying the right opportunities, innovators and endowed with solid management skills in coordinating an institutionalized network. The public authorities should, in their turn, have a developed awareness about the issues involved, be shaped by specialists and encouraged to initiate the co-production process as a support strategy for the improvement of the quality of their activities. And finally, there is a need for sufficient and responsibly-allocated resources.

On the whole, this overall picture demands from authorities to have a strong vision, be oriented towards quality and satisfaction, build trust, communication, time, specific skills, good will but also create a certain equality of roles, reciprocity in taking risks and responsibilities, without any harmful division of roles between leaders and those who obey or with no paternal relationships, as the co-production of the public service could be thought of instead as a partnership based on equality of ideas, efforts, shared results and with the involvement of all partners.

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## BUSINESS MODEL EVALUATION – A CONCEPTUAL APPROACH

Marius ALEXA\*

**Abstract:** *There has been an increased interest in business models and their use by both start-ups and existing companies in recent years due to changing and emerging business environment.*

*Although there has been an important amount of research on business models, defining the business model concept, taxonomy of business models, decomposing business models and identifying their components, ontology and design tools; the research on business model is still an area that has not been sufficiently investigated. In addition, there is a certain gap between the academic perspective to business models and the entrepreneur's perspective, there being an ever-growing need for practical and operational instruments.*

*We present in this paper the results of a review analysis on business model evaluation methods and their utility for entrepreneurs in developing and evaluating their business models.*

**Keywords:** *Business models, evaluation methods, entrepreneurship.*

**JEL Classification:** *L26, O21*

### 1 INTRODUCTION

There is a rich literature discussing diverse aspects of the business models. Some authors speak about “Internet business models”, others about “e-Business models” or “Business models on the Web”, and others refer to business models in general. Regardless of the terminology used, most agree that the accelerating growth of Information and Communication Technologies has raised the interest for changing traditional business models or developing new ones that better exploit the opportunities offered by technological innovations.

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In addition, living in an entrepreneurial context where there is a high rate of failure among companies showing a growing need for methods and instruments that would help them develop, evaluate and redesign their business models in order to become more adapted to the market and become more competitive.

This is the reason why in last few years, the discussions about business models and the impact of the Internet on them have become more advanced.

## **2 BUSINESS MODEL**

### **2.1 Literature Review on the Evolution of Business Model Concept and its Definition**

Reviewing literature on business models has become a significant task, considering the large quantity of papers published in the recent years. A DOAJ database search for “business model” from October 2014 generated 4411 titles published between 2005 and 2014. The same search on Google Academic revealed 276.000 hits for 2013 and 2014 alone, proving an increased interest on the subject not only from an academic perspective but also from an entrepreneurial one.

The term business model has been used for the first time in the Operations Research (1957) magazine in the article „On the Construction of a Multi-Stage, Multi-Person Business Game” (Bellman et al. 1957) and later on in the title and abstract of the “Educators, Electrons and Business Models: A Problem in Synthesis” (Jones 1960) paper.

Ghaziani and Ventresca (2005) show that the categories of meaning (frames) used in business model discussions vary significantly with respect to the considered time period and the related community of discourse. Their data reveal that the major shift in the frequency of use of specific business model frames is accompanied with the advent of the New Economy in the mid-1990s. At the same time, the business model concept increasingly gained importance on the research agenda of business and management science scholars. With the advent of the Internet, firms were enabled to abandon conventional ways of doing business and to develop new value creation logics (Mahadevan, 2000).

The term “business model” has started to be frequently used in literature between 1996 and 2001 since the tech boom and bust and it was considered to be the logical frame in which the organization operates and creates value for the

involved stakeholders; however, consensus on a clearly accepted definition of the term has eluded academics since the emergence of business model research in strategic management studies at the turn of the 21st century.

In Gordijn et al. (2005) opinion the concept of business models can be seen as having progressed in 5 stages: In the initial phase, the term “business model” started to gain more interest in the literature and so a number of authors recommended definitions and classifications of the concept. In the second phase, several authors begun to propose other elements that belong to business models, at first, as simple shopping lists, just mentioning the components of a business model without any clarifications or details. Only in a third phase, the components started to have detailed descriptions of their characteristics (Hamel 2000; Weill and Vitale 2001; Afuah & Tucci 2003). In the fourth phase researchers started to model the components conceptually in detailed business model ontologies. Another aspect particular to this stage is the fact that the models also started to be more meticulously analyzed, evaluated or tested. Finally, in the fifth phase, the reference models are being applied in management and IS applications.

While the term business model is widely discussed in today’s business environment, it is rarely defined explicitly (Chesbrough & Rosenbloom, 2002) and in spite of the consensus among theorists and practitioners that a good business model is essential to every organization (Magretta, 2002), no definition of the term has yet been generally accepted (Morris et al., 2005; Shafer et al. 2005; Ho et al. 2010; Muller et al. 2011).

The plethora of definitions creates significant challenges for understanding the concept and the essential components of a business model, which leads to confusion in terminology as *‘business model, strategy, business concept, revenue model and economic model are often used interchangeably... (and moreover) the business model has been referred to as architecture, design, pattern, plan, method, assumption and statement’* (Morris et al. 2005). The lack of definitional clarity is a constant source of confusion, promoting dispersion rather than convergence of perspectives and obstructing cumulative research progress on business models (Zott et al, 2011).

Timmers (1998) is one of the first authors to have proposed a definition for business models. In his opinion *“a business model includes an architecture for the*

*product or service, an information flow, a description of the benefits for the business actors involved, and a description of the sources of revenue”* (Timmers, 1998).

In the past years, business models have basically been related to value creation and appropriation. Thus, according to Shafer, Smith, & Linder (2005), the business model is the representation of a firm’s underlying logic and strategic choices to create and capture value within a value network.

Recently, the business model has become more a matter of revenue generation (Weill, Malone, D’Urso, Herman, & Woerner, 2004; Tikkanen, Lamberg, Parvinen, & Kallunki, 2005; Demil & Lecocq, 2008). The business model explains the way a company organizes itself to make money. In the most basic sense, a business model is the method of doing business by which a company can sustain itself – that is, generate revenues (Rappa, 2003).

One of the most comprehensive definitions of the business model concept is offered by Osterwalder’s (2004) who states that “*A business model is a conceptual tool that contains a set of elements and their relationships and allows expressing a company’s logic of earning money. It is a description of the value a company offers to one or several segments of customers and the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, in order to generate profitable and sustainable revenue streams*”.

After an extensive analysis of 35 business models definitions, we have concluded that the definitions of the concept range from the perspective where the business model represents only the logic behind the revenue generation process (Rappa, 2003; Ple, Lecocq & Angot, 2010) to that where the main elements are not only the processes but also the actors involved (Timmers, 1998). However an element common to all definitions is the way the company generates revenue (Rappa, 2003; Davenport, 2006; Malone et al., 2006; Ple, Lecocq & Angot, 2010; Teece, 2010) by means of using ideas, resources and technology (Chesbrough, 2006) and the way the company generates value (Petrovic et al.2001; Afuah, 2004; Weill et al., 2004; Shafer et al, 2005; Morgan, 2010; Osterwalder & Pigneur, 2010; Teece, 2010; Sorescu et al., 2011).

### **3 BUSINESS MODEL EVALUATION**

#### **3.1 The Need for Business Model Evaluation**

According to Osterwalder and Pigneur (2002), it is necessary to understand and use business models in the current increasingly dynamic and uncertain business environment. Business models help entrepreneurs to abstract from all the details and get a clear image of the big picture, to identify and understand the relevant elements in a specific domain and the relationships between them (Ushold et al., 1995; Morecroft, 1994) and can assist managers in communicating and sharing their understanding of business among stakeholders (Fensel, 2001).

The need to develop evaluation methods for business models is reasoned primarily by the fact that companies are faced with the problem to use the results from business model analysis for business process modeling improvement and (re-)design (Ballon, 2007; Harreld et al, 2007).

But the increased interest of entrepreneurs in business modeling raised other purposes of the evaluation methods such as the possibility of comparison with competitors in business model terms, the assessment of alternative business models for implementation by the same firm, the identification of risks and potential pressure areas for a firm pursuing innovation, the evaluation of an innovative business model in terms of feasibility and profitability.

A consistent method to analyze the structure, the behavior and the dynamics of a business model should allow practitioners to identify possible optimizations to the rules governing the business models behavior, to assess the impact of innovative changes to the structure of the business model and to identify critical success factors of a new or redesigned business model before the changes are implemented within a particular market (Grasl, 2008).

#### **3.2 Business Model Evaluation Approaches**

In this section, we analyze and compare several business model evaluation approaches in order to determine their utility from an entrepreneurial perspective. We have excluded from this part of the research the commercial products focusing on business model evaluation. After an extensive analysis of the research literature, it is our opinion that the business model evaluation domain has not been sufficiently investigated.

A number of authors have written on this matter, putting forward different evaluation methods (Hamel 2000, 2007; Gordijn 2002; Gordijn & Akkermans, 2003; Afuah and Tucci 2003, Amitt, Zott, 2001; Weil & Vitale, 2001; Wohltorf 2005; Horsti, 2007; Shi & Manning, 2009; Osterwalder&Pigneur, 2010), their approaches varying depending on their academic background (management, accounting, ITC).

Hamel (2000) is one of the first authors to suggest an evaluation approach which is based on his own definition of the business model: *“Business model is simply a business concept which is the capacity to imagine dramatically new ways of differentiating existing business concept”*. His approach consists of four key elements (customer interface, core strategy, strategic resources and value network) that are linked by three bridges (customer benefit, configurations and company boundaries).

The quality of this business model can be measured using four criteria, namely efficiency, uniqueness, fit and profit boosters. Efficiency refers to the extent to which the business concept is an efficient way of delivering customer benefits; uniqueness refers to the extent to which the business concept is unique and differentiation is of immense importance because the more similar business models, the less probable are chances for above-average profits. Fit refers to the degree of fit between business models elements; in order for a business model to present internal consistency, all the parts have to work together for the same end goal. The last factor from this model is profit boosters that refers to the degree to which the business concept exploits profit boosters (increasing returns, competitor lock-out, strategic economies, strategic flexibility), which have the potential to generate above-average returns. This is a criterion well elaborated by Hamel and supported by subcategories, namely network effects, positive feedback effects, learning effects, pre-emption, choke points, customer lock-in, scale, focus, scope, portfolio breadth, operating agility and lower breakeven.

This approach is one of the few that have practical guidelines on how to evaluate the business model using the four evaluation criteria efficiency, uniqueness, fit and profitability. Another important practical aspect consists in the bridges (customer benefit, configurations and company boundaries) that connect the business model elements offering a perspective over the dynamic elements of the business model and the relationships created between the business model elements.

This method can be a useful tool for entrepreneurs also because it provides detailed explanations for each item mentioned in the process.

Another evaluation approach, proposed by Amit and Zott (2001, 2007) is based on their own definitions of business models that state that “*A business model depicts the content, structure, and governance of transactions designed as to create value through the exploitation of business opportunities.*” (2001) and „*Further, a business model elucidates how an organization is linked to external stakeholders, and how it engages in economic exchanges with them to create value for all exchange partners. Business model design is defined as the design of an organizations boundary-spanning transaction*”.

The authors’ proposition suggests three perspectives from which to approach the business evaluation process: content, structure and governance, named business model “design elements”. In addition they propose four sources of value: novelty which refers to the possibility to adopt new activities (content), to manage and connect them in new ways (structure), and to define new ways of managing them (governance), lock-in, which refers to finding new ways have their stakeholders (customers, vendors, and partners) locked into the business by managing a switching cost that prevents the stakeholders from trying other products or market offerings; complementarities, which refers to the bundles of goods that provide more value than the total separate value of each single good and efficiency that refers to transaction efficiency in terms of reduced costs. They name these sources “design themes” of a business model.

Business models contain all three design elements and all four design themes. Depending on their profile, different businesses will focus on different themes of this cluster. In their opinion, the novelty-centered and efficiency-centered business models have a positive impact on entrepreneurial firms (Amit & Zott, 2007).

The advantage of this proposal is that the system design parameters and the configuration theme provide a comprehensive way of understanding how to design a successful business model. However their method is primarily qualitative and it doesn’t offer instruments/criteria to measure each element of the process making it rather challenging to use for entrepreneurs.

Afuah and Tucci (2003) propose an evaluation method that appraises business models on three levels: profitability measures, profitability predictor

measures and business model component attribute measures. The first level embraces earnings and cash flows, two frequently used indicators by analysts. If a company's earnings or cash flows are better than those of its competitors, this would mean that it has a competitive advantage. The second level comprises profit margins, revenue market share and revenue growth. In this case also, for a firm to have a competitive advantage these measures should show a better performance than the competition. The third and capital level provides benchmark questions for each of Afuah and Tucci's business model components.

*Table 1* Appraising a Business Model: Component Measures

<b>Component of Business Model</b>	<b>Benchmark Questions</b>
<b>Customer Value</b>	Is customer value distinct from that of the competitors? If not, is the firm's level of value higher than that of competitors? Is the firm's rate of increase in customer value high relative to that of competitors?
<b>Scope</b>	Is the growth rate of market segments high? Is the firm's market share in each segment high relative to that of competitors'?
<b>Pricing</b>	Is potential erosion of products high? If so, in what segments?
<b>Revenue Source</b>	Is the quality-adjusted price low? Are margins and market share in each revenue source high? Are margins and market share in each revenue source increasing? Is the firm's value in each source of revenue distinctive? If not, is the level of value higher than that of competitors?
<b>Connected Activities</b>	What is the extent to which activities: Are consistent with customer value and scope? Reinforce each other? Take advantage of industry success drivers? Are consistent with the firm's distinctive capabilities? Make the industry more attractive for the firm?
<b>Implementation</b>	Is the quality of the team high?
<b>Capabilities</b>	To what extent are the firm's capabilities: Distinctive? Inimitable? Extendable to other product markets?
<b>Sustainability</b>	Has the firm been able to maintain or extend its lead in its industry?

The method suggested by Afuah and Tucci (2003) has the advantage of having both a quantitative and a qualitative approach, but its utility is highly based on the possibility to compare the business model that is under evaluation with those of its competitors, so, entrepreneurs would need to have access to information regarding their competitors

Probably the most advanced proposition for evaluating business models is outlined by Gordijn and Akkermans (2001, 2003) and is part of their e3-value ontology, a value model which shows actors who are exchanging things of economic value with each other. Their method focuses on studying the economic feasibility of an e-business idea in quantitative terms based on an assessment of the value of objects for all actors involved by creating a profit sheet and assessing the value of objects for all actors involved by assigning a value expressed in monetary units. Business model feasibility represents the possibility of all the actors involved to make a profit or to increase their economic utility.

The authors admit that this evaluation serves for building confidence in an e-business idea rather than calculating precise profit estimations, which would be unrealistic.

Further, the authors introduce an additional confidence building step through the elaboration of “what-if” scenarios. This helps stakeholders understand the sensitivity of e-business models with respect to its parameters, such as financials, future trends or customer behavior. In many cases, this sensitivity analysis can potentially be of greater interest than the numbers themselves.

The main advantage of this quantitative evaluation method is that it focuses on the analysis of the expenses and benefits of the e-commerce idea to all actors involved and is realistic because all the relations and dependencies between components of the e3-value ontology are taken into account.

Companies can use the “what-if” scenarios to analyze the financial effects of different pricing models, number of employees, etc. Also, based on the scenario-based evaluation entrepreneurs can perform sensitivity analysis. However, there is a certain difficulty in finding a generic scenario for all business models, which can be problem of this evaluation method.

Another business model evaluation tool is the “Scoring-Model for Success Evaluation of Ubiquitous Services” developed by Wohltorf’s (2005) which focuses mainly on services and is based on critical success factors. In Wohltorf’s opinion

there are three domains to which the success factors can be allocated: user, competition, and technology.

After determining the adequate success factors, Wohltorf's tool gives quantitative values from 1 to 6 to these success factors. 1 – 2 are good, 3 – 4 are middle, and 5 – 6 are bad. Afterwards these values are weighted, and the three main domains become the average value of the regarded success factors. The values of the three main domains are also weighted and the overall value comes out. The business model is considered to be successful if the overall value is bigger than a threshold.

One of the advantages of this instrument is that it is an MS-Excel based tool, but one of the main disadvantages is that the approach ignores the relations and dependencies between success factors. Moreover, the domains considered are limited and it doesn't offer the possibility to do a profitability check which is an important aspect when evaluating a business model.

This particular instrument is more appropriate to evaluate new services rather than business models.

Morris, Schindehutte, Richardson and Allen (2006) stated that "limited progress has been made in establishing criteria for evaluating models or their underlying components" so they suggest seven performance indicators for evaluating the overall business model: uniqueness, profit potential, internal consistency, comprehensiveness, imitability, robustness, adaptability and sustainability.

However, they don't propose any method for quantifying and applying them, so it is not clear how it can be operationalized.

A business model is according to Ballon et al "*a description of how a company or a set of companies intends to create and capture value with a product or service. A business model defines the architecture of the product or service, the roles and relations of the company, its customers, partners and suppliers, and the physical, virtual and financial flows between them*" (Ballon, Kern, Poel, Tee, & Munck, 2005).

Based on this definition of the concept, a multitude of aspects of the architecture of a business model must be considered in order to be able to evaluate it in a holistic and meaningful way and even more so to generate an improved version of it. Ballon et al proposes a framework of five steps to evaluate a business model which is presented in table no. 2.

**Table 2** Framework for business model evaluation (Poel, Renda, & Ballon, 2007)

Steps	Activities	Sources	Results
<b>1. Objectives and scope</b>	Decide on objectives of the study, scope (which services, markets, innovations, policy domains), case study selection	Discussion with client, plus desk research (e.g. for case selection)	Study implementation plan
<b>2. Business models</b>	For each case: analyze the design of business models: value proposition, value network, functional architecture, financial model	Desk research, to be validated in interviews with representatives of the cases/organizations	Business model descriptions
<b>3. Market developments</b>	Aggregate business model analysis (cases) to the level of market developments	Desk research, across all cases, to be confronted with existing studies	Overview of market developments
<b>4. Innovation topics</b>	Aggregate business model analysis (cases) to the level of innovation topics	Desk research, across all cases, to be confronted with existing studies	List of innovation topics
<b>5. Bottlenecks</b>	Identify position and explore perceived bottlenecks in the business model framework: what and where are the bottlenecks?	Interviews with representatives of the cases/organizations	Overview of bottlenecks and how they are linked to the business model

When approaching the development of the system the authors considered the primary use of the system should be to enable a dynamic, multi-domain and multi-stakeholder approach, focusing on identifying and possibly remedying bottlenecks and systemic failures of a current business model (Poel, Renda, & Ballon, 2007, p. 88).

The framework presented by Ballon et al provides a systematic approach to evaluate business models, completed with instruments and clear steps to be followed by entrepreneurs during the evaluation process.

Another author Horsti (2007) presents an evaluation tool for e-business models based on critical success factors gathered from a literature review on management research and an empirical study on five e-business models from

different industries. The management research consists of business model framework, critical success factors, and life cycle model literature.

In his tool, Horsti adopts the categorization of Hedman & Kalling's (2003) framework as which includes seven components that are causally related: customers, competitors, activities and organization, resources, offering, supply of factor and production input, and management scope. The first six components are cross-sectional and can be studied at a given point in time. The management scope is included to cover the dynamics of the business model over time, and the cognitive and cultural constraints that managers have to cope with.

Like Wohltorf, Horsti also gives quantitative values to individual success factors and uses a threshold, but unlike him, he does not give weights to the values. In Horsti's instrument the success factors are not ranked according to their importance, they are presented as a flat list and are categorized under business model components. Plus the instrument doesn't present a clear image of the causal inter-relations between the business model elements.

A very important feature of his method is that the success factors are analyzed very deeply and it is clear how they are gathered. Plus, the method allows entrepreneurs to do a profitability check.

One of the most complex business evaluation models is offered by Osterwalder and Pigneur (2010) and is based on their Business Model Canvas. The Business Model Canvas serves to create a common and shared understanding of a business model throughout the organization and all its stakeholders. It is a graphical description of how an organization goes from value proposition to satisfied customer and it consists of nine important building blocks, which define the current business model in a structured way, focusing on four main areas of a business: customers, offer, infrastructure and financial viability. The complete nine building blocks are: customer segments, value proposition, channels, customer relationships, revenue streams, key resources, key activities, key partnerships and cost structure.

The evaluation method consists in two types of assessments: the first one is a big picture assessment using the Business Model Canvas. In the second phase they use a set of checklist for assessing a business model's strengths, weaknesses, opportunities, and threats (SWOT) in order to evaluate each Building Block. They

point out that “*assessing a business model from a big picture perspective and assessing it from a Building Block perspective are complementary activities.*”

<b>Key Partners</b>	<b>Key Activities</b>	<b>Value Propositions</b>	<b>Customer Relationships</b>	<b>Customer Segments</b>
	<b>Key Resources</b>		<b>Channels</b>	
<b>Cost structure</b>			<b>Revenue Streams</b>	

*Figure 1* Business Model Canvas

*Table 3* Business Modal Canvas with details (Osterwalder and Pigneur, 2010)

Key Partners	Who are our Key Partners? Who are our key suppliers? Which Key Resources are we acquiring from partners? Which Key Activities do partners perform?
Key Activities	What Key Activities do our Value Propositions require? Our Distribution Channels? Customer Relationships? Revenue streams?
Key Resources	What Key Resources do our Value Propositions require? Our Distribution Channels? Customer Relationships? Revenue Streams?
Value Propositions	What value do we deliver to the customer? Which one of our customer’s problems are we helping to solve? What bundles of products and services are we offering to each Customer Segment?
Customer Relationships	Which customer needs are we satisfying? What type of relationship does each of our Customer Segments expect us to establish and maintain with them? Which ones have we established?
Customer Segments	How are they integrated with the rest of our business model? How costly are they? For whom are we creating value? Who are our most important customers?
Channels	Through which Channels do our Customer Segments want to be reached? How are we reaching them now? How are our Channels integrated?

Cost structure	Which ones work best? Which ones are most cost-efficient? How are we integrating them with customer routines? What are the most important costs inherent in our business model? What Key Resources are most expensive? What Key Activities are most expensive?
Revenue Streams	For what value are our costumers willing to pay? For what do they currently pay? How are they currently paying? How would they prefer to pay? How much does each Revenue Stream contribute to overall revenues?

Osterwalder & Pigneur's evaluation is carried out by using SWOT analysis. They ask questions for each building block in Business Model Canvas. They answer the questions by giving quantitative values from +5 to -5 to the individual strength and weakness points. They also quantify their importance to the business model and the certainty of evaluation between 1 and 10.

The Business Model Canvas is an instrument designed and perfected by entrepreneurs for entrepreneurs and it brings clarity and simplicity to an area that can be complicated and technical. However there are some downsides to it: first of all the method offers little direction concerning which aspects of an organization to analyze or more detailed description on how it should be performed, , secondly, it is not possible to see how the output of the assessment would look like.

Based on Business Model Canvas several other business model evaluation instruments have been developed, such as the Service Business Model Canvas (Zolnowski & Böhmman, 2013; Zolnowski et al., 2014) or the Lean Canvas (Ash Maurya, 2009).

#### 4 CONCLUSIONS

The study we carried out showed that the evaluation of business models has not been sufficiently researched, business and accounting theory depending on the academic background of the authors who developed it.

Just like when it comes to the definition of the business model concept, there is no common bases for business model evaluation and the fact that a lot of authors put forward new and personal instruments without taking into account previously

designed tools leads to losing good and useful ideas, repeating others and making literature dealing with the subject seem inconsistent.

There is also an important gap between the academic perspective and the practical needs of entrepreneurs, who want to develop, evaluate and redesign their business models. There is a need for simple and versatile instruments that are easy to understand and use by entrepreneurs. In practice, most of them use different combinations of the two or most of the methods presented above.

However, there is a trend in literature researching business models that points out an increased interest toward the evaluation process of business models motivated by the fact that the dynamic business environment is in a constant need for solutions and instruments used to understand why some businesses perform better than others and how can they transform/adjust their business model in order to become more competitive.

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## BOOK REVIEW

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## **MUREȘAN, CORNELIA (2012), Changes of family behavior in Romania. A life course approach , Cluj, Presa Universitara Clujeana**

Reviewed by Raluca MARDARE

After the fall of the communist regime, Romania experienced dramatic changes in family formation behavior. Common patterns include delay and/or decline of marriage and fertility, increasing rates of non-marital cohabitations and non-marital childbearing, rising rates of divorce. All of these changes manifested in all post communist countries at different intensities and timing and were described by demographers as part of a “second demographic transition” caused by the economic cultural and normative shifts that occurred at the beginning of the 90s.

*Changes of family behavior in romania. A life course approach (Schimbările comportamentului familial în România. O abordare din perspectiva cursului vietii)*, edited in 2012 by Presa Universitară Clujeană introduces students and young researchers to the field of Demography and Family Sociology by means of a new approach studying changes in family and reproductive behavior. Cornelia Mureșan is a professor at the Faculty of Sociology and Social Work at Babeș Bolyai University of Cluj and is a member of the Center of Population Studies at the same University. The author dedicated most of her work and research to family demographics, fertility and population aging, approaching these demographic phenomena from a life course perspective using event history analysis. The author believes that the classic methods of analysis, based on the interpretation of macroeconomic indicators, cannot take into account the subtle changes in the behavior of individuals. The study of Mureșan (2012) is a response to a group of researchers who argue on the need to use life-course paradigm in demographic behavior research. As a result, the author describes family life in Romanian society by using data at micro individual level

from Generations and Gender Survey carried out in Romania in 2005 and by applying event history analysis methods. This book consists of articles written by the author during years of research on the subject and it opens new horizons in changes in family and reproductive behavior research. It should be noted that the author was the first to introduce event history analysis in Romania and the results provide a new perspective to socio-demographic research.

Divided into three parts, summarizing 16 chapters, the book covers both elements of demographic theory and findings of the author based on Generations and Gender Survey (2005) data.

Part I is dedicated to theoretical elements related to research design, types of data and methods of analysis. It is an excellent starting point for researchers in the field. The author describes, without going into details, the main issues that need to be considered when preparing a research on the topic of changes in demographic behavior: understanding the nature of the phenomenon, identifying the most suitable approach and how to choose the correct variables and design a work schedule. Among the methods described, in terms of advantages and disadvantages, the reader can find details on descriptive non-parametric methods, such as Life Table Method and Kaplan-Meier estimates together with the regression analysis of hazard rates, all of which are key elements of event history analysis. Although these are useful tools for statistically informed researchers, the theoretical background of these first chapters is more a framework on which to build one's research.

Chapters 4 and 5 provide a detailed presentation of Total Fertility Rate (TFR) as it is the most important demographic indicator to be considered in analyzing the evolution of fertility behavior. However, one must take into account that the disadvantage of using TFR, resides in that it only controls the age structure of the population and not other features, such as parity, ethnicity or education. In addition to the specific elements of statistical theory underlying the presented results, the author provides the reader with numerous sources of information on the issues discussed. As an innovation, complementary to age-based total fertility rate, the author propounds the union-based total fertility rate for measuring couples fertility. This indicator considers explicitly the births that occur in any form of union, thus generalizing marital total fertility rate.

Once the mathematical problems of estimating the impact of marital status on fertility have been solved, findings accompanied by detailed explanations on

how they were obtained are presented, as well as the logical process that stood behind the approach.

Part II is devoted to the descriptive aspects of changes in family behavior. Due to unprecedented amount of information available through the Generation and Gender Survey, this part includes research not only on marital and fertility behavior but also other family-related life experiences. Events, such as leaving the parental home, first partnership formation, transformation of the first cohabitation, first marriage transformation and also the experiences of children have been analyzed from a new perspective. The opportunity to study these events is of interest not only to researchers in the field of sociology and demographics but also for policy makers in the field of family protection, and it is a solid starting point for further research.

Prior to presenting the results, the author brings to the reader's attention the Generation and Gender Survey sample with detailed emphasis on the structure of the questionnaire and methods used for data collection. Further, the author presents the descriptive methods, Kaplan Meier estimates and Life Tables providing the reader with information regarding the sample structure. The life tables presented in this part of the book are of three types. Those in which demographic events of one's life are described and where the unit of observation is the individual, others in which the unit of observation is the cohort providing information on life experiences of both women and men living together, and finally, as a novelty, we find life tables in which the unit of observation is the child providing information on experiences of children who during their childhood have a new parent if they were born to single mothers, or experience the loss of a parent through separation, divorce or death.

Descriptive analysis shows that young adults have not become more independent in Romania after 1990, since a decrease in the percentage of those who leave the parental home is recorded, which falls among economic challenges that the country faced after the fall of communist regime. Starting with 2000, there has been, however, an increase in the percentage of young adults leaving parental home, and an increase in the age when this event occurs. Also, changes in first union formation behavior, either consensual or marital have been observed. The general trend indicates a postponement of first union formation, an increase in celibacy at young ages, a decrease in the percentage of young adults entering first unions, consensual or through marriage and an increase in the average age at which

these events occur. Most first cohabitations turn into marriage rather fast, after about 1-2 years. The birth of a child into a consensual union or the decision to get out of the union, are more difficult decisions to make, usually after 3-4 years. Research shows that although the most common is the transformation of consensual unions into marriage, followed by the birth of a child and much later separation, there are signs of increased separation tendencies and marital disruption. An important aspect is that, since 2000 motherhood has longer been universal among women. Female infertility, voluntary or involuntary, increased from 7% in 1989 to 20% in 2005. Adding to this phenomenon an increase in the average age at first birth by 3 years, the result is that more than 50% of women become mothers aged over 26.

In Part III, the author focuses on the possible explanations for the changes in family behavior described in Part II. Using event history analyses, the author studies the impact of risk factors using regression models with hazard rates. The life course perspective allows performing the analysis of the risk of suffering a demographic event, where the passage of time is a risk in itself. Results reveal interesting aspects regarding demographic behavior changes suggesting that the Romanian family is subject to manifestations similar to those described by the Second Demographic Transition theory although traditional values are still well preserved and still influence marital and fertility behavior. Therefore, postmodern values regarding family life are not as rooted in Romania as they are in Northern and Western Europe, although there are signs that after the 2005, these phenomena have risen in importance.

In a context of continuous changes in social and economic environment that affect both individuals and their families, this book comes with a new understanding on how economic, social and cultural changes influence individuals from a life course perspective. From this perspective, it can be seen as one of the most important studies in Romania on this topic.

Although at first sight the book seems to have an exhaustive approach on the issue, one can find directions for further research, since the author herself describes the book more as a manual designed to point the important aspects in researching changes in demographic behavior and it gives researchers the liberty to choose the path of their further investigations.