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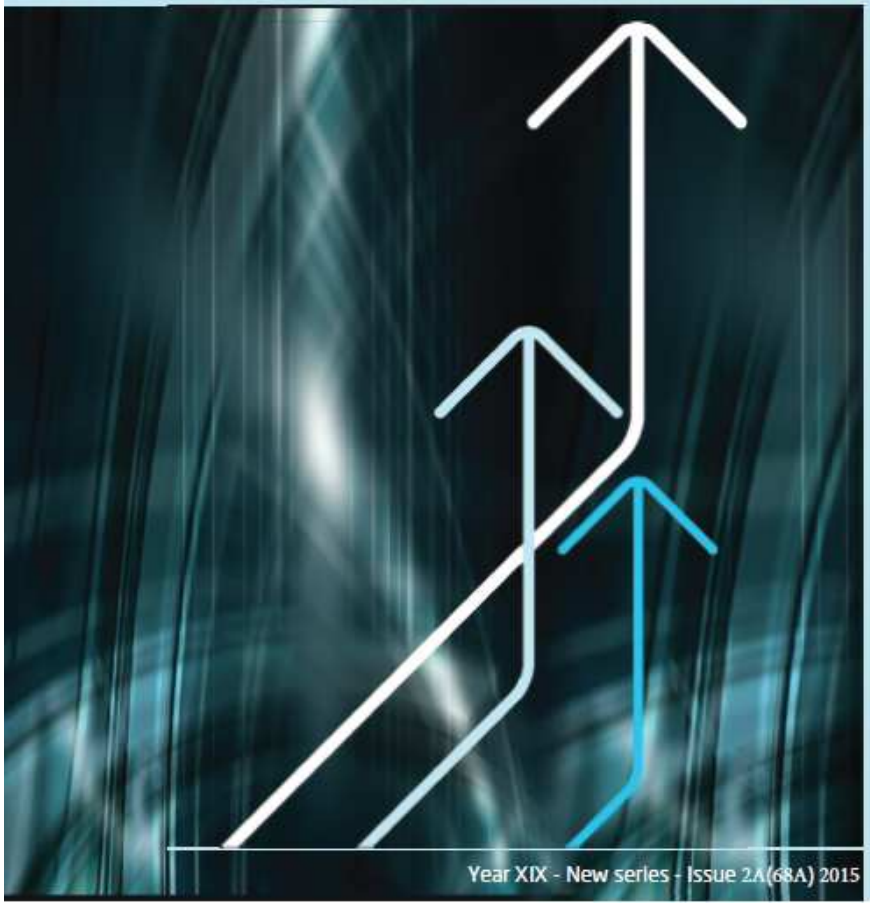

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“VICTOR SLĂVESCU” CENTRE FOR FINANCIAL
AND MONETARY RESEARCH

FINANCIAL STUDIES

ROMANIAN ACADEMY
"COSTIN C. KIRIȚESCU" NATIONAL INSTITUTE FOR ECONOMIC RESEARCH
"VICTOR SLĂVESCU" CENTRE FOR FINANCIAL AND MONETARY RESEARCH

FINANCIAL STUDIES

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CONTENTS

LONGEVITY IMPACT ON THE LIFE ANNUITIES ON ROMANIA BY COMPARATIVE ANALYSIS WITH BULGARIA AND HUNGARY

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Cristian Ioan SOLOMON[**]

Abstract

People are living longer worldwide than they were two decades ago, as death rates are falling. There are significant differences on life expectancy between males and females, and across the countries, and between regions. But the real question is how will develop further the death rates and how much will increase the cost of life annuities or other retirement benefits. The present paper aims to analyse the development of the death rates on Romania, Bulgaria and Hungary, and how this trend will impact on the amount required to get a life annuity at the age of 65 years. Mortality and trend modelling is beyond the mathematical and econometric exercise, but this paper will look only on the methods for forecasting the mortality rates. This paper represents the authors' personal opinions and does not reflect the views of the institutions they are affiliated to.

Keywords: mortality rates, Lee-Carter method, Booth-Maindonald-Smith method, Coherent mortality forecasting

JEL Classification: J11, C53, G22

1. Introduction

In this paper, the impact of longevity on the life annuities will be study based on the evolution of mortality rates on Romania. The Lee-Carter method will be used to model the mortality pattern for Romania. The results will be compared with the results of applying the same method for Bulgaria and Hungary. For these countries the Lee-Carter model cannot be applied with satisfying results, since there have been major changes in mortality rates on last 25 years. But one of the strength of the model is that it really shows the

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predominant trend in the population, with a descending or ascending curve (Scherp, 2007).

However, the authors have not found any article where Lee-Carter model has been applied to mortality data from Romania. Further, we will focus more on the mortality trend on Romania and we will compare the results of Lee-Carter method with other methods Booth-Maindonald-Smith (BMS) (2002) and the Coherent functional demographic model as described in Hyndman, Booth & Yasmeen (2012).

The ageing of the population became a growing concern for governments and societies. The concerns are concentrated on the sustainability of pensions and health systems, especially given increased longevity. The government policy makers and planners are more interested nowadays in accurately modelling and forecasting age-specific mortality rates. A more accurate forecast mortality rates would be beneficial for decision makers with impact on the allocation of current and future resources. The forecast of mortality rates are of great interest to the insurance and pension industry, this industry being under the pressure of low interest environment also.

At least 10 new approaches for forecasting mortality rates and life expectancy using statistical modelling were proposed on the last decade by different authors. The method of Lee and Carter (1992) is still a milestone in demographic forecasting. “They used a principal component method to extract a single time varying index of the level of mortality rates, from which the forecasts are obtained using a random walk with drift. Since then, this method has been widely used for forecasting mortality rates in various countries” (Han, Heather, Hyndman, 2011).

The most important argument for Lee-Carter (LC) method is the simplicity and robustness of its application on the age-specific log mortality rates that have linear trends. On the other hand, the weakness of the LC method is that it attempts to capture the patterns of mortality rates using only one principal component.

Life expectancy at birth in early stages was about 20 to 30 years, by the middle of the 19th century it rose to 40 years. Rapid improvements began at the end of the 19th century, so that by the middle of the 20th century it was approximately 60 to 65 years on the developed countries. At the beginning of the 21st century, life expectancy at birth reached about 70 years.

There are three stages on the development of the mortality rates. The first stage is characterized by no development of the life

expectancy at birth and high volatility from one year to another. This is due to the fact that the people are less protected against extreme weather, flu epidemics. On this stage there is high mortality for young children also. Stage one can be compare with the situation of underdeveloped countries. On the second stage there is a steep increase of life expectancy and less volatility, as on the post industrial revolution period. This is due to medical developments, a better protection against weather conditions, improved hygiene, and cleaner drinking water. This stage is comparable with the situation of emerging countries. Stage three is typical for developed countries where the developments such as the quality of drinking water are reaching the limits. Particularly behaviour can cause more independency in development of the differences between male and female life expectancy (van Broekhoven, 2015). The progress on the medical field can improve the life expectancy on this stage, for example the use of angioplasty as a treatment in case of a heart attack had impacted the trend on 2001.

For life expectancy on the stages one and two it is easy to predict the future using the history but on the stage three the history can not really be used to predict the future. On the following decades, a decrease of life expectancy is possible, as well, in the coming 50 years. This could be caused by climate changes, development of resistance to antibiotics effects or behaviour causes, such as obesity.

Mortality and trend modelling is not just a mathematical and econometric exercise. Specially on the stage three, the history is a bad predictor of the future. Expert judgment method needs to be added, particularly from a medical/demographic view (van Broekhoven, 2015).

Periods and prospective life tables

There are two main types of life tables, period life tables and the prospective life.

The period life tables are tables with mortality rates, indicating the “probability” of dying during a one year period of time, depending on the age only. These tables take into account that mortality is on average greater when the person is older but they do not consider that mortality evolves with time. In this case, the future mortality is supposed to be exactly the same as the mortality today.

The prospective life tables, on the contrary, contain mortality rates depending on the age but also on the considered year. As

mortality is evolving with time, expected future changes in the mortality rates can be captured with time-depending models. The prospective tables are also known as cohort life tables. In this present paper we will use prospective tables to calculate the actuarial present value of a life annuity at the age of 65.

2. Mortality forecasting methods

In this section, we review three methods for forecasting mortality rates and life expectancy, namely the LC method, the Booth-Maindonald-Smith method (BMS) and the new coherent functional demographic model as described in Hyndman, Booth & Yasmeen.

On the modelling process, it is necessary to transform the mortality rate data by taking the natural logarithm in order to avoid the high variance associated with high age-specific rates. The observed mortality rate at age x in year t is denoted $m_{t;F}$. This mortality rate is calculated as the number of deaths at age x in calendar year t, divided by the corresponding mid-year population aged x. The fitted and forecasts models are all in logarithmic scale.

2.1. Lee-Carter (LC) method

The structure of the model proposed by Lee and Carter (1992) is given by the equation:

$$ln(m_{x,t}) = a_x + b_x k_t + \varepsilon_{x,t} \quad (1)$$

where,

a_x is the age pattern of the log mortality rates averaged across years;

b_x is the first principal component reflecting relative change in the log mortality rate at each age;

k_t is the first set of principal component scores by year t and measures the general level of the log mortality rates;

$\varepsilon_{x,t}$ is the residual at age x and year t.

The LC model in (1) could be regarded as over-parameterized in the sense that the model structure is invariant under the following transformations:

$$\{a_x, b_x, k_t\} \rightarrow \{a_x, b_x/c, ck_t\}$$

$$\{a_x, b_x, k_t\} \rightarrow \{a_x - cb_x, b_x, k_t + c\}$$

Lee and Carter (1992) imposed two constraints in order make the model identifiable, framed as:

$$\sum_{t=1}^{n} k_t = 0 \quad , \quad \sum_{x=x_0}^{x_p} b_x = 1 \quad (2)$$

where,

n is the number of years and p is the number of ages in the observed data set.

Further, on the LC method k_t is adjusted by refitting to the total number of deaths. The adjustment mentioned gives more weight to higher rates, thus roughly counterbalancing somehow the effect of using a log transformation of the mortality rates. The adjusted k_t is later extrapolated by the use of ARIMA models.

Lee and Carter (1992) used a random walk with drift model, which can be expressed by the equation:

$$k_t = k_{t-1} + d + e_t \quad (3)$$

where,

d is the drift parameter and measures the average annual change in the series;

e_t is an uncorrelated error.

Random walk model with drift provides satisfactory results in many cases (Tuljapurkar, Li, and Boe 2000; Lee and Miller 2001. From the forecast of the principal component scores are obtained the forecast of the age-specific log mortality rates using the estimated effects on ages a_x and b_x in equation (1).

2.2. Booth-Maindonald-Smith (BMS) method

Booth-Maindonald-Smith (BMS) method is a variant of the LC method. BMS method has three differences from the LC method:

1. The fitting period is determined on the basis of a statistical 'goodness of fit' criterion, under the assumption that the principal component score k_t is linear.

2. The adjustment of k_t involves fitting to the age distribution of deaths rather than to the total number of deaths.

3. The jump-off rates are the fitted rates under this fitting regime (Han, Heather, Hyndman, 2011).

Under the LC method the best fitting time series model of the first principal component score is linear. And later Booth, Maindonald and Smith (2002) observed that the linear time series can be compromised by a structural change.

The BMS method, under the assumption of linear first principal component score, tries to achieve an optimal 'goodness of fit' by choosing the optimal fitting period. This optimal fitting period is selected from the possible fitting periods that are ending in year n and

is determined based on the smallest ratio of the mean deviances of the fit of the underlying LC model to the overall linear fit.

Instead of fitting to the total number of deaths, the BMS method fits to the age distribution of deaths using the Poisson distribution to model deaths, and using deviance statistics to measure the 'goodness of fit' (Booth, Maindonald and Smith 2002). The jump-off rates are taken to be the fitted rates under this adjustment. (Han, Heather, Hyndman, 2011).

2.3. Coherent mortality forecasting: the product-ratio method with functional time series models

"Non-divergent forecasts for sub-populations within a larger population have been labelled "coherent" (Li & Lee 2005). Coherent forecasting seeks to ensure that the forecasts for related populations maintain certain structural relationships based on extensive historic observation and theoretical considerations. For example, male mortality has been observed to be consistently higher than female mortality at all ages, and while available evidence supports both biological/genetic and social/cultural/environmental/behavioural hypotheses as to why this is so, Kalben (2002) concludes that the determining factor is biological. Thus sex-differences in mortality can be expected to persist in the future and to remain within observed limits. Mortality forecasts for regions within the same country can also be expected not to diverge radically. Differences due to environmental and biological factors can be expected to remain unchanged, while differences due to social, political, behavioural and cultural factors are unlikely to produce persistent divergence in modern democracies where principles of equality apply. Similar arguments may apply to countries within a common economic and political framework such as the European Union." (Hyndman, Booth, Yasmeen, 2012, p.3)

Up to the definition of coherence by Hyndman, Booth and Yasmeen from 2012, this has been defined the most precisely as the non-divergence of forecasts for sub-populations. They adopted a far more precise definition labelling "mortality forecasts as coherent when the forecast age-specific ratios of death rates for any two subpopulations converge to a set of appropriate constants." (Hyndman, Booth, Yasmeen, 2012).

The coherent mortality forecasting is based on the method of forecasting the interpretable product and ratio functions of mortality

rates under the functional data paradigm introduced in Hyndman & Ullah (2007).

„The product-ratio functional forecasting method can be applied to two or more sub-populations, incorporates convenient calculation of prediction intervals as well as point forecasts, and is suitable for use within a larger stochastic population modelling framework such as Hyndman & Booth (2008). The new method is simple to apply, flexible in its dynamics, and produces forecasts that are at least as accurate in overall terms as the comparable independent method." (Hyndman, Booth, Yasmeen, 2012).

Review of the coherent functional method

The method can be applied to any number of sub-populations of the main population by contrast to the common and well known approach of forecasting male and female age-specific death rates.

$m_{t,F}$ denotes the female death rate for age x and year t, t = 1,...,n. The logarithmic death rate will be modelled by the following:

$$y_{t,F}(x)=\log[m_{t,F(x)}]$$

Under the functional data paradigm, one assume that there is an underlying smooth function $f_{t,F}$ (x) that we are observing with error.

Thus,

$$y_{t,F}(x_i) = \log[f_{t,F}(x_i)] + \sigma_{t,F(x_i)}\varepsilon_{t,F,i} \qquad (4)$$

Where, xi is the centre of age-group i (i = 1,...,p), $\varepsilon_{t,F,i}$ is an independent and identically distributed standard normal random variable and $\sigma_{t,F}(x_i)$ allows the amount of noise to vary with age x.

For smoothing, it is used the weighted penalized regression splines (Wood 1994) constrained so that each curve is monotonically increasing above age x = 65 (see Hyndman & Ullah 2007). The weights are to take care of the heterogeneity in death rates across ages. The observational variance $\sigma_{t,F}(x)$ is estimated by using a separate penalized regression spline of $\{y_t(x) - \log[f_{t,F}(x_i)]\}^2$ against x, for each t.

According with the Product-ratio method for males and females, the square roots of the products and ratios of the smoothed rates for males and females, are defined as follows:

$p_t(x) = \sqrt{f_{t,M}(x)f_{t,F}(x)}$ (5) and $r_t(x) = \sqrt{f_{t,M}(x)/f_{t,F}(x)}$ (6).

These functions will be modelled rather than the males and females death rates, with the advantage of that the product and ratio will behave almost independently of each other provided the sub-populations have approximately equal variances. Considered on the log-scale, these will transform in sums and differences which are approximately uncorrelated. In case of substantial differences in the variances of sub-populations, then the product and ratio will no longer be uncorrelated on the log scale. This can make the forecasts less efficient.

The functional time series models (Hyndman & Ullah 2007) for $p_t(x)$ and $r_t(x)$ are used:

$$\log[p_t(x)] = \mu_p(x) + \sum_{k=1}^{K} \beta_{t,k}\phi_k(x) + e_t(x) \quad (7)$$

$$\log[r_t(x)] = \mu_r(x) + \sum_{i=1}^{L} \gamma_{t,i}\Psi_i(x) + w_t(x) \quad (8).$$

Where, $\{\phi_k(x)\}$ and $\{\Psi_i(x)\}$ are the principal components obtained from decomposing $\{p_t(x)\}$ and $\{r_t(x)\}$ respectively, and $\beta_{t,k}$ and $\gamma_{t,i}$ are the corresponding principal component scores.

3. Empirical Studies

Fitting and applying the Lee-Carter model

The data available for the studied countries are:

Country	Time period	Ages used in the model	Source
Romania	1968-2013	0 – 100, 1 year age groups	EUROSTAT
Bulgaria	1947-2003	0 – 100, 1 year age groups	www.mortality.org
Hungary	1950-2001	0 – 98, 1 year age groups	www.mortality.org

The parameters are fitted using the method presented in Section 2.

We applied the Lee-Carter model to the data and start by analysing the $k_t$values and the b_x values. Residuals will then be studied. In case of data for Bulgaria and Hungary we have excluded the time periods before 1975 in order to improve the fit of the model. In case of data for Romania, the mortality rates were available on

Eurostat only until for ages between 0 and 86. Therefore, the value for 86 years was considered also for ages between 87 and 100.

Figure 1

LC parameters for Romania

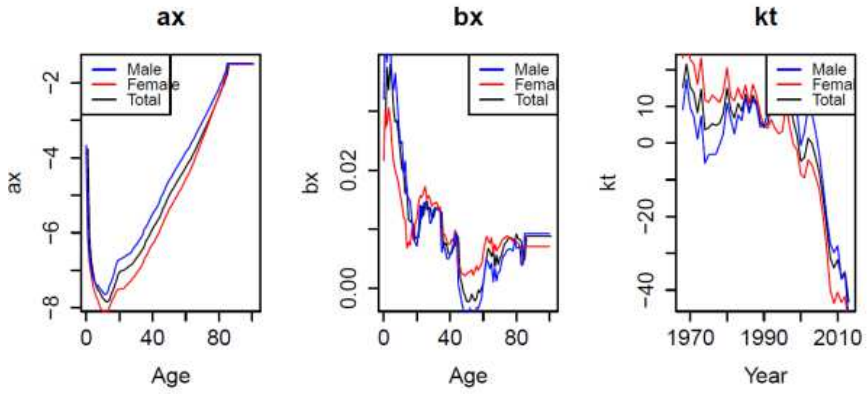


Figure 2

LC parameters for Bulgaria

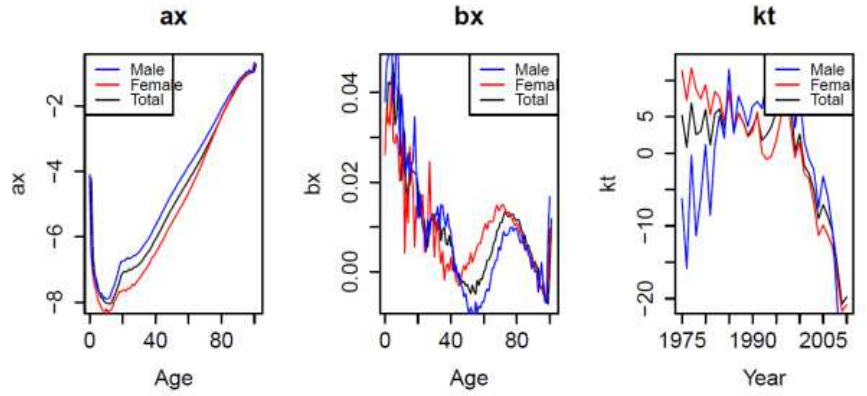
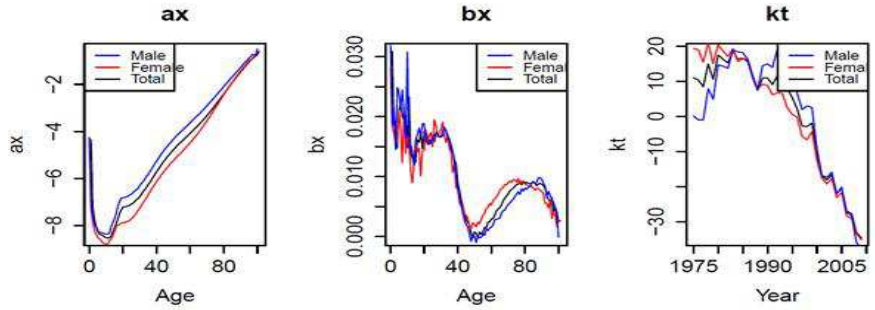


Figure 3

LC parameters for Hungary



The parameter a_x is reflecting the age pattern of the log mortality rates averaged across years. For the analysed countries the shape of a_x chart is very similar.

Regarding the parameter b_x which is reflecting relative change in the log mortality rate at each age, the most effected by the change in mortality rates is the youngest part of population and this is decreasing by age. But, there is a change in this trend for population at 20 years.

The less effected being the population between 45 and 65 years. Around the age of 80 there is a local maxim of b_x, and then is decreasing on the ages closing to 100.

Parameter k_t is giving the time trend of the general level of the log mortality rates. For Romania this estimated trend looks most similar for males and females comparing to the other two countries. In all three countries k_t for females has the general descending trend. By contrast k_t for males on Hungary and Bulgaria has an initial ascending trend till 1985.

In Bulgaria on 1993 the mortality rates start a new ascending trend till 1997 when are reversing again.

In case of Hungary, the mortality rates for males start increasing from 1988 till 1993. After 1993 the rates for males and female decreased till 2010.

For Romania, the mortality rates start to increase on 1990, specially the rates for males, till 1996. On 2001 there is another increase for 3 years. The development of the trend is shown in figure 4 and figure 5.

Figure 4

Parameter Kt estimated for mortality rate in case of Romania

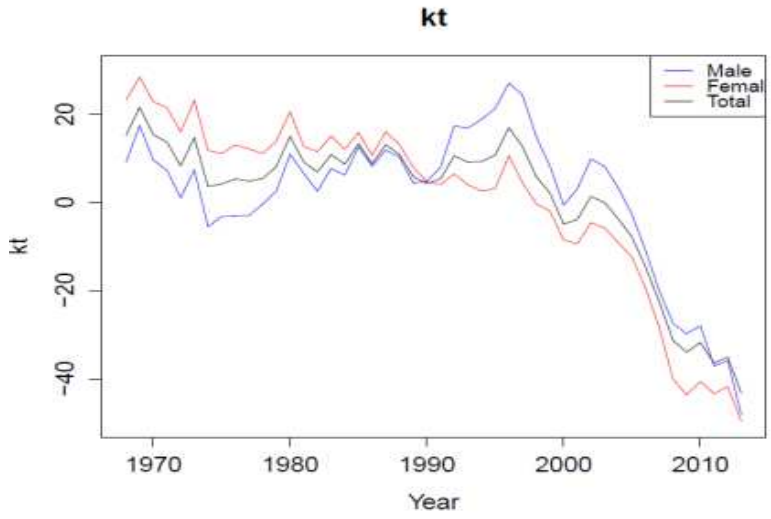
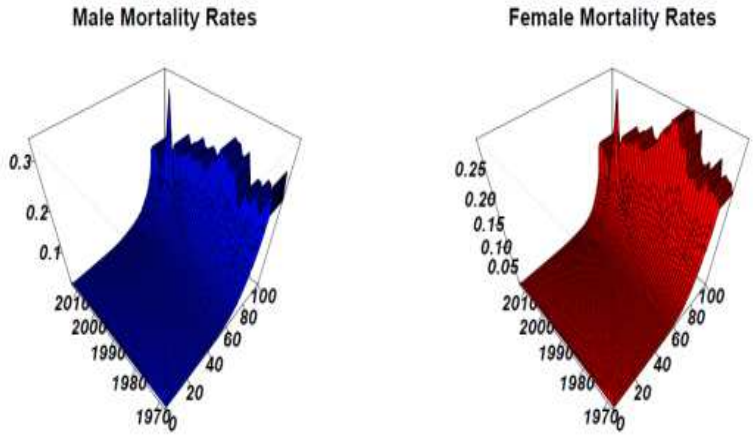


Figure 5

Mortality rates by age and year of birth on Romania



As conclusion, the parameter k_t shows the predominant trend in the mortality rates of the population, and this can be considered for forecasting the future development.

Based on the fitted parameter we forecasted the development of the mortality rates using an 80% confidence level.

Figure 6

Forecast of k_t parameter for Romania

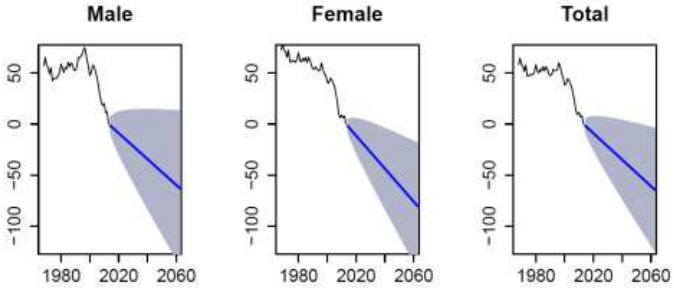


Figure 7

Forecast of k_t parameter for Bulgaria

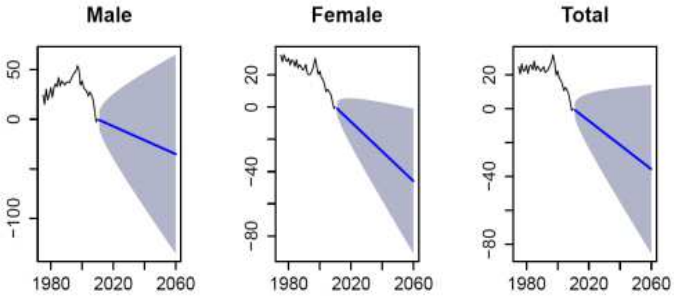


Figure 8

Forecast of k_t parameter for Hungary

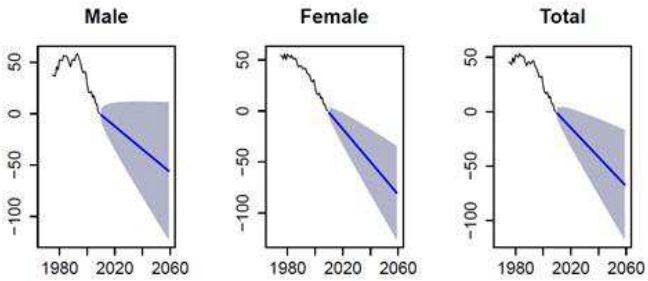
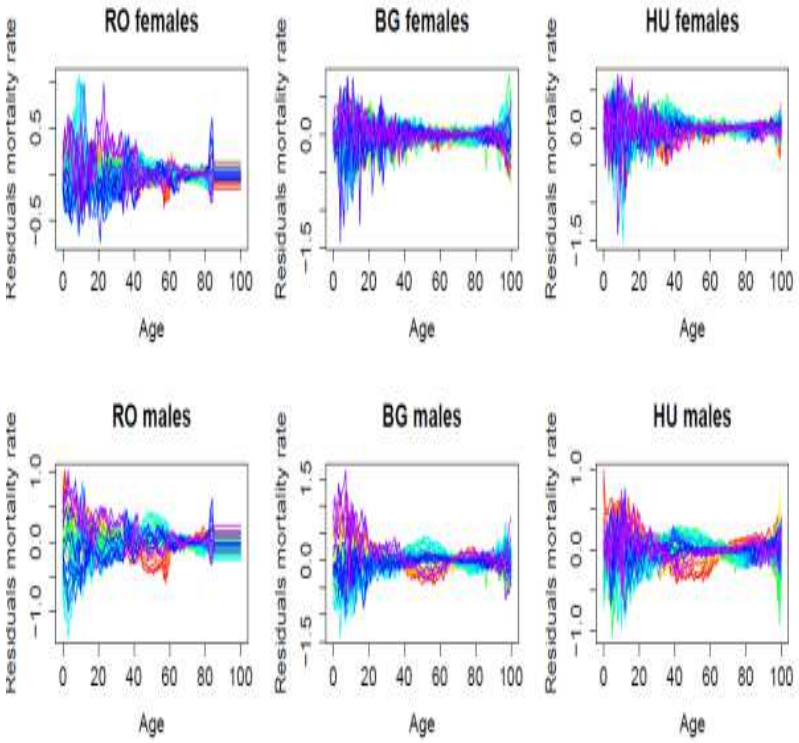


Figure 9

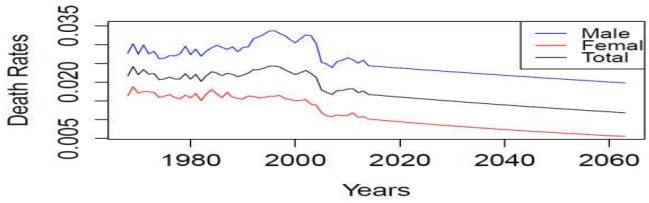
Residuals of LC parameter estimations by country



The distribution of the residuals across the ages is not uniformed and it shows that the model can not capture the change in case of the divergent evolution on different ages.

Figure 10

Mortality rate at 65 year for Romania



Further, based on the estimated mortality rates we generated prospective life tables and we calculated the life expectancy at birth, life expectancy at 65 and the actuarial present value of a life annuity starting at 65. The summary of the results are shown on tables 1, 2 and 3.

Table 1

Life expectancy at birth calculated based on the forecasted mortality rates fitted with LC method

	Life expectancy at birth					
	Females			Males		
Actual age	RO	BG	HU	RO	BG	HU
30	81,28	79,76	81,26	70,39	68,67	70,42
40	79,2	78,37	79,18	69,09	67,76	68,43

Table 2

Life expectancy at 65 calculated based on the forecasted mortality rates fitted with LC method

	Life expectancy at 65 years					
	Females			Males		
Actual age	RO	BG	HU	RO	BG	HU
30	22,78	18,1	22,45	18,24	15,21	17,02
40	21,74	17,76	21,55	17,49	14,92	16,34

Table 3

Actuarial present value of a life annuity calculated based on the forecasted mortality rates fitted with LC method

	APV life annuity					
	Females			Males		
Actual age	RO	BG	HU	RO	BG	HU
30	17,99	15,34	17,93	14,78	13,01	14,09
40	17,35	15,09	17,35	14,32	12,8	13,65

The interest rate used to calculate the actuarial present value for the life annuities is 2%. Additional risk loadings or fees were not considered.

Actuarial Present Value (or APV) is the expected value or certainty equivalent, of the present value of a conditional cash flow stream (i.e. a series of random payments). Actuarial present values are typically calculated for the series of payments associated with life insurance and life annuities. The probability of a future payment is based on assumptions about the person's future mortality which is typically estimated using a life table. (Bowers, N.L. et all, 1997).

4. Comparison between results of the three models used for forecasting the mortality rates for Romania

We have used the LC method, the Booth-Maindonald-Smith method (BMS) and the coherent functional demographic model of Hyndman, Booth & Yasmeen to forecast the mortality rates by age and cohort. Based on the estimated mortality rates we generated prospective life tables for each method and we calculated the life expectancy at birth, life expectancy at 65 and the actuarial present value of a life annuity starting at age of 65. The interest rate considered was 2% p.a. constant, and no other fees or reserves were considered. The summary of the results are shown on tables 4, 5 and 6.

Figure 10

Life expectancy at birth - by cohort (years)

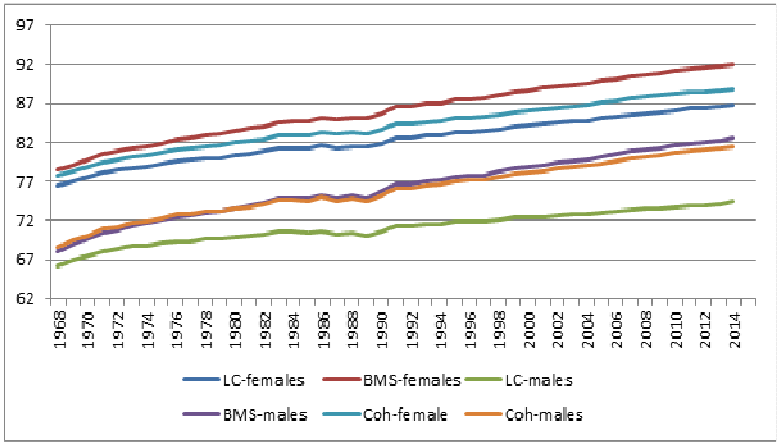
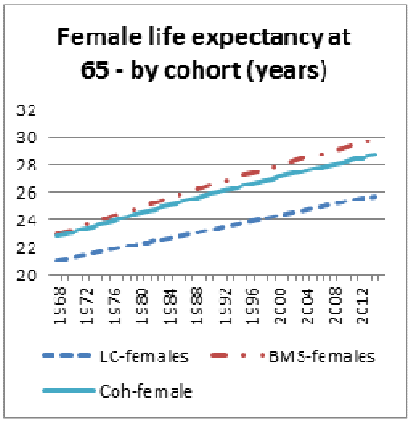


Figure 11

Life expectancy at 65 - by cohort (years)



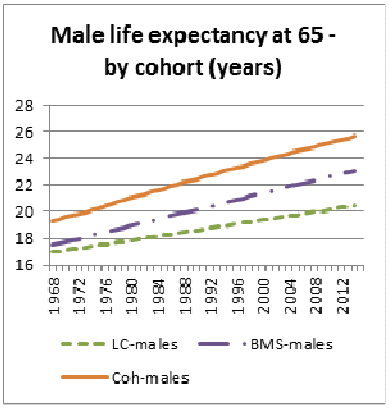


Figure 12

Life expectancy gap between males and females - by cohort (years)

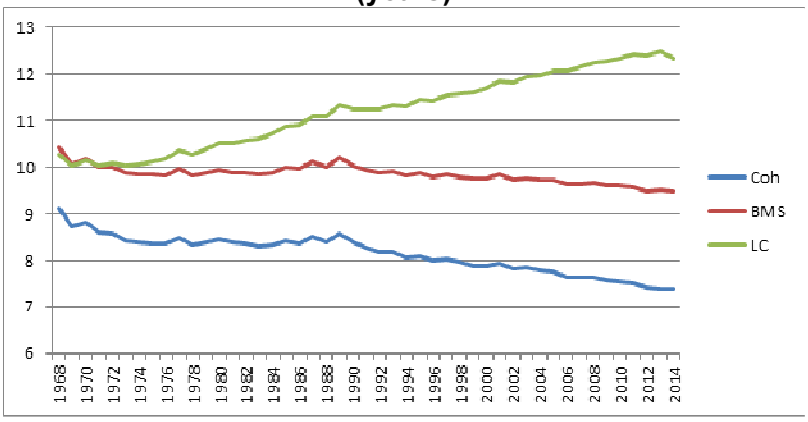


Table 4

Life expectancy at birth calculated based on the forecasted mortality rates fitted with LC, BMS and Coherent functional demographic model

	Life expectancy at birth					
	Females			Males		
Actual age	LC model	BMS model	Coherent model	LC model	BMS model	Coherent model
30	81,28	84,77	82,95	70,39	74,77	74,53
40	79,20	81,88	80,65	69,09	72,04	72,29
47	76,43	78,44	77,71	66,14	68,02	68,60

Table 5

Life expectancy at 65 calculated based on the forecasted mortality rates fitted with LC, BMS and Coherent functional demographic model

	Life expectancy at 65 years					
	Females			Males		
Actual age	LC model	BMS model	Coherent model	LC model	BMS model	Coherent model
30	22,78	25,71	25,18	18,24	19,56	21,76
40	21,74	24,12	23,79	17,49	18,35	20,29
47	21,01	22,97	22,82	16,98	17,51	19,30

The interest rate used to calculate the actuarial present value for the life annuities is 2%.

Table 6

Actuarial present value of a life annuity calculated based on the forecasted mortality rates fitted with LC, BMS and Coherent functional demographic model

	APV life annuity					
	Females			Males		
Actual age	LC model	BMS model	Coherent model	LC model	BMS model	Coherent model
30	17,99	19,75	19,04	14,78	15,70	16,78
40	17,35	18,79	18,21	14,32	14,93	15,88
47	16,89	18,09	17,64	13,99	14,40	15,27

The interest rate used to calculate the actuarial present value for the life annuities is 2%. Additional risk loadings or fees were not considered.

Conclusions

For all three models used in this paper the trend for mortality rates in Romania is decreasing on the following decades. However, there are some differences on how fast the mortality rates will decrease.

Considering the fact that additional risk loadings or fees were not considered, it is possible that the actuarial present values (APV) of the annuities mentioned in this paper to be higher than the calculated values with up to 10%.

In case of generation that has actual age 30 years, in order to get a life annuity at the age of 65 they will need 19.75 times the annual amount they want to receive until death, in case of females, using the BMS model. In case of males, they will need 16.78 times the annual amount they want to receive until death Coherent model.

We could assume that the annuity provider will try to use the most conservative model in order to be on the safe side otherwise they will have to commit capital and the shareholders of the annuity provider will not be pleased.

Referring to generation with actual age 47 years, were the accumulated amount needed is 18.09 times for females and 14.40 times for males, this is due to the difference in life expectancy at 65 age according with BMS model. Furthermore, if risk buffers are considered for longevity, interest rates and other risks than the accumulated amount needed will be around to 20 times the annual amount they want to receive until death, for females and around 16 times for males.

Due to the increasing trend in life expectancy the individuals having the age of 30 years will need 9% more in the accumulated amount at 65 years in order to get a life annuity, comparing with the individuals having the age of 47.

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INSURANCE OF RISKS SPECIFIC TO NON-REIMBURSABLE FUNDS MANAGEMENT SYSTEM IN ROMANIA

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Abstract

Non-reimbursable funds in Romania represented a yearly average of about 4 bln. Euro during the financial period 2007-2013 and have the potential to exceed 5 bln. Euro annually during 2014-2020. The field is very complex: governed by many European and national regulations and managed by hundreds of state authorities and institutions, in which thousands of people are working.

Thus, the risk management in this field represents a key element, although is mainly based on theoretical procedures undertaken with limited staff numbers and, in the most cases, with low specific training related to risks and risk management.

Given that risk transfer is mentioned among the risk management measures included in the current methodologies, is to be determined if and how many of the identified risks can be subject to insurance programs and insurance products.

Even if state authorities and institutions have not so far shown interest in the use of insurance products to transfer some of the risks inherent in non-reimbursable funds management, such an approach is both possible and desirable.

Keywords: non-reimbursable funds, risk, insurance, risk management

JEL Classification: G22

About the non-reimbursable funds management system in Romania

As Member State of the European Union, in order to use the development funds available, Romania has put in place complex

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mechanisms of funds management. Its complexity is given by the huge number of regulations applicable, both European and national; the hundreds of state authorities and institutions involved, in which thousands of people are working; the broad range of funding beneficiaries, covering almost all the organizations recognized by Romanian law (public authorities and institutions, companies, NGOs, religious organizations, trade unions, employers, etc.).

Alongside the EU structural and cohesion funds and the EU rural development funds, Romania can use also other international donor funding, such as World Bank, USAID, SEE and Norwegian Funds, etc. This broad range of non-reimbursable funding is completed, for the beneficiary organizations, with the Romanian national grant schemes.

In terms of projects submitted for funding from the EU structural and cohesion funds, on 30/04/2015 there were 45,131 projects with a total of 77,157,081,753.69 Euro requested funding (Romanian European Funds Ministry, 2015); while at the same date the rural development projects numbered 150,259 and accounted for 18,426,374,019 Euro (Romanian Ministry for Agriculture and Rural Development, 2015) requested funding. By the mentioned date only 19,231 projects were approved for funding from EU structural and cohesion funds and 97,264 for funding from EU rural development funds; the available financial allocations from both sources were about 26.3 billion Euro.

In the 2007-2013 financial period, the non-reimbursable funding available in Romania from all the above mentioned sources accounted for almost 4 billion Euro annually, which represents about 3% of Romania's GDP[1] in 2013. For the 2014-2020 financial period, the available EU funding that can be used through projects managed by Romanian authorities will increase up to 30 billion Euro; adding the other funding resources (other international donors, Romanian national funds etc.) the annual average has the potential to exceed 5 billion Euro.

[1] *"Estimated GDP for 2013 was 631,130.1 million lei, current prices" Source: Romanian National Institute of Statistics - http://www.insse.ro/cms/files/statistici/comunicate/pib/a13/pib_trimIVr2013_1.pdf*

Risk management of the non-reimbursable funds management system in Romania

The funds management system in Romania is carried by public bodies (state authorities and institutions at regional and local level) or bodies that state assigned with competencies and responsibilities, such as the regional development agencies, which basically are NGOs. Thus the risk management is subject to regulation.

In Romania, the risk management in the activity of the state authorities and institutions is regulated as a standard of internal control / management within the Order of Ministry of Public Finance no. 946/2005, further amended and supplemented. This Order defines risk management as the *"methodology aimed at providing a comprehensive risk control, allowing the maintaining of an acceptable level of risk exposure for the public entity, with minimal costs".*

Also this regulation states that "the manager is required to create and maintain a health system of internal control/management, mainly by:

- identifying the major risks that may affect the effectiveness and efficiency of operations, rules and regulations, confidence in the financial and internal and external management, protection of property, fraud prevention and detection;
- defining the acceptable level of exposure to these risks;
- evaluating the likelihood that the risk will materialize and the size of its impact;
- monitoring and evaluation of risks and the adequacy of internal controls to manage risks;
- verifying the budget execution reporting, including the one based on programs".

Based on this regulation at the level of the public authorities and institutions responsible for managing grants were adopted and are in place risk management procedures.

Main provisions of the risk management procedures

The analysis of these risk procedures[2] showed that it represents in fact only reproductions more or less complete of the

[2] *The analysis of the risk procedures was carried on during January and May 2015, using the provisions of the Law no. 544/2001 on access to public information. It implied preparing and submitting formal requests to 50 major authorities/institutions involved in non-reimbursable funds management.*

Methodology of implementation of internal control standard "Risk Management"[3]. Also, the procedures used by different state authorities and institutions are for the most part similar.

Thus, the procedures contain the following:

- risk definition
- risk identification
- risk evaluation
- risk control/management
- action plan for reducing risks
- models of documents to be used

As for the present analysis regarding the insurance of risks specific to non-reimbursable funds management system in Romania important are the definition of risk and the inclusion of insurance as management measure.

Risk definition

Despite the fact these procedures flow from the same regulation, risk definitions varies depending on the state authority or institution. Thus, within the procedures applicable to Sectorial Operational Program Human Resources Development (SOP HRD) the risk is defined as *"potential danger, for a system or entity, that, by producing some events/actions or by lack of action, the goods and/or reputation or objectives fulfillment for all the system/entity components is affected"*.

Within the procedures applicable to Regional Operational Program (ROP) and Fishing Operational Program the risk is defined as *"problem (situation, event, etc.) which didn't occur but that can occur in the future, in which case reaching the planned results is threatened or boosted. In the first case the risk represents a threat, while in the second risk is seen as opportunity. The risk represents the uncertainty in reaching the envisaged results and has to be treated as a combination of probability and impact"*.

Within the procedures applicable to Romanian national funds for SMEs, the risk is defined as *"the possibility to produce an event which might have an impact on objectives fulfillment"*.

These definitions are in line with the provisions of the ISO 31000:2009[4] standard and with the PMBOK Guide[5], which defines it

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(3) Methodology for implementation of the internal control standard "Risk management" developed in 2007 by the Ministry of Finance - Central Harmonization Unit of Financial Management and Control Systems.

as an event or uncertain condition, which, if appears, has a positive or negative effect on one or more of the project objectives.

A slightly different approach has the European Commission which, in the PCM Guidelines[6], defines it as "the probability that an event or action may adversely affect the achievement of project objectives or activities. Risks are composed of factors internal and external to the project, although focus is generally given to those factors outside project management's direct control". We can see that, for its aid programs the European Commission treats risk only as a problem, not as an opportunity.

In the economic theory there are many definitions of risk, some of it depicting only the negative aspects: potential loss, loss caused by the evolution of risk factors to the contrary of the expected results (Bârsan-Pipu, 2003). Other definitions (Mehr and Forbes, 1973) focus on the financial negative aspects involved by risks.

Comparing the definitions in the procedures adopted in Romania by the public authorities and institutions responsible for managing grants with those from different international bodies or those in the economic theory, we note that the first refer to positive aspects and opportunity although the state has the mission the efficiently use the public resources. We consider that the state authorities should use risk management as tool for minimizing negative effects and increase the degree of objectives fulfillment.

Defining risk as opportunity in the public sector seems inappropriate, especially in the context in which none of the risks

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[4] The standard ISO 31000:2009 was developed by the International Organization for Standardization. ISO 31000:2009, Risk management – Principles and guidelines, provides principles, framework and a process for managing risk. It can be used by any organization regardless of its size, activity or sector. Using ISO 31000 can help organizations increase the likelihood of achieving objectives, improve the identification of opportunities and threats and effectively allocate and use resources for risk treatment.

[5] The PMBOK Guide, 5th edition, revision 3, 2014, page 338. The PMBOK Guide (A guide to the Project Management body of knowledge) was developed by the Project Management Institute, the world's leading not-for-profit professional membership association for the project, program and portfolio management profession, founded in 1969.

[6] Project Cycle Management Guidelines, vol. 1, 2004, page. 145, published by the European Commission and available at https://ec.europa.eu/europeaid/sites/devco/files/methodology-aid-delivery-methods-project-cycle-management-200403_en_2.pdf

identified by the above mentioned authorities refer to a positive situation of opportunity in terms of delivering the public services in a better manner.

Insurance as risk management measure

Each of the risk methodologies used by the state authorities and institutions include provisions related to risk control measures. The following were identified:

- acceptance (tolerance) of risks
- ongoing monitoring of risks
- avoiding risks
- transfer (outsourcing) of risks
- treat (alleviate) of risks

With regards to **transferring risks** the procedures stipulate that *"this risk response strategy is to entrust a third party with risk management expertise to manage that risk, ending a contract for this purpose. This aims, on the one hand, reducing the exposure of the organization, and on the other hand, effective risk management by a specialized third party. This option is especially beneficial if the financial and economic risks"; "It is important to note that some risks are not (fully) transferable. In particular, it is not possible to transfer risks related to the credibility of the organization. The organization remains accountable to beneficiaries, even if some services is contracted with third parties"*.

None of the analyzed procedures present insurance as the possibility of risk transfer. This is only mentioned within the *Methodology of implementation of internal control standard "Risk Management".*

Nevertheless **the Romanian insurance market offers some products related to non-reimbursable funds, but primarily aimed at recipients of funding:**

- liability insurance of the professionals working within projects (accountants, financial auditors, legal advisers, architects, engineers etc.)
- advanced payment bonds
- performance bonds

Also, some of the financing programs require beneficiaries to insure the equipment bought within projects, for the implementation period plus 3 to 5 years after the implementation.

The insurance liability of the professionals working within projects offers financial protection needed for paying damages to the beneficiary of the services rendered by the professionals, for damages caused to it as a result of the failure to the fault (negligence, carelessness, omission) the due diligence work undertaken under the agreement concluded with the beneficiary and for which the professional becomes liable under the laws and the profession.

The advanced payment bonds guarantees repayment by the beneficiary of financing of the amounts which the state authority or institution managing the non-reimbursable funds has paid in advance for the project implementation.

The performance bonds is a guarantee instrument requested to the companies that sign a public procurement contract (including the ones within projects). The beneficiary organization of non-reimbursable financing has a warranty that protects it against the risk of failure or improper fulfillment of the contractual obligations assumed by the company executing a contract part of a project.

Analysis of the risks identified for the non-reimbursable funds management activities

Within the analysis of the current procedures of risk management an inventory of the risks was structured. It comprises over 500 individual risks, as they were defined by the state authorities and institutions within the risk registers in force. Sorting these risks in order to eliminate duplicates it is conditional to the provision within the risk methodologies that, in order to establish if a situation represents a risk, it should be linked to objectives. Considering that only one of the risk registers received from the state authorities and institutions links some of the identified risks to the objectives of financing or specific activities, a correct sorting of all the risks is very difficult. It should be done by the risk officers representing all the state authorities and institutions involved in non-reimbursable funds management.

The first finding of the analysis is that ***not all the state authorities and institutions have risks registers***, either because an authority higher in hierarchy is expected to fulfill such a register, either because no risks have yet been identified.

The second finding within risk registers analysis is that ***most of the risks in the inventory are operational risks***, such as:

- risks of delay/overdue (ex: delay of administrative compliance and eligibility assessment of project applications; delay in the

submission of documents on irregularities management to Certification and Payment Authority; delays in financing contract signing; delays in projects implementation).

- risks of omission/error detection (ex: identification of errors in documents; not detecting errors because of lack of accuracy in checks).
- risks of financing quality (ex: errors in the technical and economic assessment of funding applications; closing underperforming contracts within the projects; promoting bad quality projects).

Of course, the effects of all these operational risks will most probably have a financial quantification, but only in conjunction situations (ex: financial corrections established by the European Commission for repeated errors in project documents).

The third finding of the analysis is that a ***few of the risks*** included in the risks registers ***have direct financial effects***:

- certification of ineligible expenditure
- authorization of expenditure that can subsequently be declared ineligible by entities entrusted with audit / control
- repeated payment for the same invoice included in several refund requests
- payment made to a bank account other than that the one specified in the refund requests
- not finishing projects

The fourth finding of the analysis is related to ***global risks***. Thus we identified the following two, which should be carefully and continuously monitored by all the state authorities and institutions:

1) automatic decommitment of funds (low absorption rate).
2) financial corrections established by the international donors.
3) quality of financing (results, effects and impact of projects).

The fifth finding of the analysis is that ***some risks are not included in the risk registers***. For example, there are no risks related to projects impact assessment or effects quantification, neither to use of current results for the next programming periods. Also, the only risks related to external audit phase is that on not ensuring an adequate audit trail. No risks related to feasibility of projects were reported, although for all the infrastructure projects (pre)-feasibility studies are required by regulations in force.

Most of the identified risks are related to implementation of projects and some to evaluation and contracting phases.

The sixth finding of the analysis is that risks don't follow the Project Cycle Management phases[7]; ***risks are identified and organized at department level***. During to discussions to officials of the Ministry of the European Funds, it come up the fact that each department proposed risks to be included in the risk registers and only that specific department is following it.

This approach has consequences on quality of the identified risks, as these are mostly related to current activities and not to objectives of the financing (ex: "non-unitary replies", "risk of losing documents", "poor quality of the fulfillment of duties").

The seventh finding of the analysis is that ***the human resources involved are few and in most part unprepared on risk management***. For example, Ministry of the European Funds, which is coordinating 5 operational programs (transport, environment, human resources, economic competitiveness and technical assistance) has no personnel trained on risk management and the person responsible for the current risk management activities is responsible for all the 25 procedures required by Order 946/2005 issued by Ministry of Finance. Also the Ministry of the European Funds does not have a risk register or action plan for reducing risks.

The state authorities and institution that responded at the requests the analysis is based on reported 4.699 employees, out of which only 380 are responsible on risk activities or work related to it and 321 participated in a training course on risk management. 4 institutions out of the 50 reported that do not have a risk officer (risk management responsible) and a 17 reported their employees did not attend a course in the field.

The eight finding of the analysis is that, although the risk management procedures define risk also as opportunity, which enhances objectives achieving, ***all the risks included in the registers have negative connotations*** (their effects are negative).

Can the identified risks be subject to insurance programs and insurance products?

As we already mentioned above, none of the analyzed procedures present insurance as the possibility of risk transfer.

[7] *According to European Commission the 5 major phases of the project management are: programming, identification, formulation, implementation (including monitoring and reporting) and evaluation and audit (see Project Cycle Management Guidelines – available at http://ec.europa.eu/europeaid/aid-delivery-methods-project-cycle-management-guidelines-vol-1_en).*

Nevertheless a discussion about the possibility of creating insurance programs and insurance products should be made for the risks identified by the state authorities and institutions managing non-reimbursable funds. In this respect, the following questions have to be asked:

1) Which risks are insurable and which are not?

For an insurance company, at least at theoretical level, any risk can be insured. But this has a cost. Which is the cost the public administration can afford to pay and for which risks?

For example, we consider that some of the risks identified within the current registers must not be insured because of their nature or their subjectivity. For example, the risk of losing documents has a broad covering, from the situation in which the public servants do not do their jobs correctly (ex: an officer carries some documents in a file out of the office building and forgets it on a public bench) to the situation in which a disaster is happening (ex: some documents disappear in a fire).

Other risks must not be insured because of the difficulty in establishing correct financial effects. For example the risk "the emergence of legislative changes related to the management of non-reimbursable funds" is very difficult to quantify and the insurance company would probably establish a prohibitive insurance premium in order to have covered all possible situations.

2) Which would be the key insurable risks?

As mentioned above, three global risks should be considered:

- automatic decommitment of funds (low absorption rate)
- financial corrections established by the international donors
- quality of financing (results, effects and impact of projects)

If we consider that at the level of May 2015 the absorption rate of the Structural and Cohesions Funds is 54.22%[8] out of 19,21 billion Euro, it means that the decommitment of funds amounts almost 8.8 billion Euro. If at the end of 2015, the absorption rate will be 80%, the decommitment will be at 20% (almost 4 billion Euro). In this case, what insurance premium should be established by an insurance company?

If we take the risk of financial corrections applied to Romania by the European Commission, the former minister of European funds

[8] *www.fonduri-ue.ro.*

in Romania, Mr. Eugen Teodorovici declared in March 2015 that *"The financial corrections on the current financial framework today we estimate to one billion euros. These are financial corrections coming on the particular system, the public procurement the most of it. That is the price paid by Romania for having put people in key positions, which, unfortunately, were not to be there. And especially in the area of public procurement"*[9].

Ensuring the risks related to quality of financing will probably be easier to accept by the state authorities and institutions, as it can be established as an obligation of the beneficiaries. But this could be accepted by the private beneficiaries, as the public ones having trouble in finding the financial resources for it.

Having in mind only the private beneficiaries, we can state that the funds it will be available for it will surely be more than 1 billion Euro per year. Adding to it their co-financing, it results an yearly insurable "market" of 2 billion Euro or more.

Key issues influencing insurability of the risks related to the management of the non-reimbursable funds

The following key issues have a decisive influence in insuring the risks identified by the state authorities and institutions managing the non-reimbursable funds:

1) the risks relate to the activity of these authorities and institutions, of the will and competencies of its personnel, as the regulation of the field is done also by the state. It might happen that further regulation influence in a bad manner present insurance contracts, so that insurance companies be negatively affected and state pay less. On the other hand regulation might be used to favor some insurance companies in a broad corruption situation.
2) in this moment there is no database recording the situations related to the identified risks (frequency, impact, specific conditions etc.). Thus an effective insurance program/product cannot be created.

[9] *See the article "Romania will pay one billion Euro financial corrections for the past budgetary framework" available at http://www.agerpres.ro/economie/2015/03/19/teodorovici-romania-va-plati-un-miliard-de-euro-corectii-pentru-cadrul-financiar-trecut-15-09-31*

Conclusions and proposals

In this moment, the risk management in the field of non-reimbursable funds is one of "another" activities of the state authorities and institutions managing the non-reimbursable funds. The risk registers contain vague expressions considered risk and do not cover all the project cycle management phases. Furthermore, the major risks are not present in the risk registers of all the state authorities and institutions involved.

Although the insurance market provides some insurance products related to accessing non-reimbursable funds, these products does not cover the risks currently identified by the state authorities and institutions managing non-reimbursable funds.

The risk management is not use as a decision-making instrument. Currently the risks are identified and treated at department level and in some cases at institutional level. It is not used as basis for legislative modifications or improvement measures for the financing programs.

Currently the personnel involved in the risk management is in short number and underprepared on specific issues.

The following measures have to be undertaken in order for the risk management of the non-reimbursable funds be more effective:

- an exhaustive inventory should be done by the state authorities coordinating the main non-reimbursable funding (Ministry of European Funds, Ministry of Regional Development and Public Administration, Ministry of Agriculture and Rural Development, Ministry of Finance);
- all the risks should be organized on Project Cycle Management phases and should be effectively covering all these phases;
- each state authority and institution that manages funds should permanently monitor all the risks, establish which is active or not, counting frequency, impact and specific conditions of happening. These should be placed in a public database;
- quarterly and annually risks analysis of all the system should be done in order to prepare decisions for the overall system;
- encouraging insurance companies to prepare insurance programs and products to cover some of the identified risks;
- create a coherent risk management system covering all the financing programs and train the personnel assigned in the position of risk officers.

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TURBULENCE AND SYSTEMIC RISK IN THE EUROPEAN UNION FINANCIAL SYSTEM

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Abstract

The purpose of this paper is to analyze the performance of the Absorption Ratio (AR), defined as the fraction of the total variance of a set of asset returns explained or "absorbed" by a fixed number of eigenvectors, as a leading indicator of turbulence in the European Union financial markets over the period January 2000 – July 2015. Using an event study methodology centered around financial turbulence episodes, identified with a method based on the Mahalanobis distance, we find that shifts in AR of more than one standard deviation consistently predict crisis episodes in the sample about 20 trading days before they happen, at the aggregate EU level as well as at individual level for most countries in the sample. We offer an interpretation of the ratio as a measure of systemic risk and financial fragility, and suggest its inclusion in the regulatory toolkit of systemic risk measures, to be relied on in combination with other indicators as a signal for the activation of certain macro-prudential policy instruments.

Keywords: financial fragility, systemic risk, financial turbulence, contagion, principal components, subprime mortgage crisis, Eurozone debt crisis

JEL Classification: C53, G01, G12, G15, G17

1. Introduction

Before the start of the financial crisis of 2007-2009, the literature on systemic risk had focused on contagion and "financial fragility". De Bandt and Hartman (2000) provide an early review. Following the financial crisis, the interest in defining, measuring and monitoring systemic risk has surged. Research projects aimed at systematizing the literature on systemic risk and at developing new systemic risk measures and models have received generous funding by public institutions in developed countries. The most prominent result of this trend is the study published by Bisias, Flood, Lo and

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Valavanis (2012)[1], which surveys in a comprehensive fashion systemic risk analytics developed in recent years. The authors survey 31 quantitative measures of systemic risk in the economics and finance literature. They classify the measures under six categories: (1) macroeconomic, including costly asset-price boom/bust cycles, property-price, equity-price, and credit-gap indicators, macro-prudential regulation; (2) granular foundations and network measures, including the default intensity model, network analysis and systemic financial linkages, simulating a credit scenario, simulating a credit-and-funding-shock scenario, granger-causality networks, bank funding risk and shock transmission, mark-to-market accounting and liquidity pricing; (3) forward looking risk measures, including contingent claims analysis, Mahalanobis distance, the option iPoD, multivariate density estimators, simulating the housing sector, consumer credit and principal components analysis; (4) stress-test measures, including GDP stress tests, lessons from the SCAP, a 10-by-10-by-10 approach; (5) cross-sectional measures, including CoVaR, distressed insurance premium, Co-Risk, marginal and systemic expected shortfall; and (6) measures of illiquidity and insolvency, including risk topography, the leverage cycle, noise as information for illiquidity, crowded trades in currency funds, equity market illiquidity, serial correlation and illiquidity in hedge funds returns, broader hedge-fund based systemic risk measures.

In the survey, two measures stand out as simple, practical and easy to implement: the Mahalanobis distance, used to identify episodes of financial turbulence, and the Principal Components Analysis, used to capture the extent to which markets are unified or tightly coupled, and thus fragile.

In this paper we estimate a measure of financial turbulence in the European Union financial system based on the Mahalanobis distance and map its performance to a timeline of events that unfolded during the most recent three global crisis episodes: the subprime mortgage crisis originating in the United States, the Eurozone debt crisis and the Russia-Ukraine conflict. Moreover, we explore the prediction ability of another indicator, based on principal

[1] *This study is the first working paper published by the Office of Financial Research, operating under the U.S. Department of the Treasury. The Office has been established under the Dodd Frank Act, enacted by the U.S. Congress in July 2010.*

components analysis, to signal the approach of such crisis episodes or, in other words, to act as a leading indicator of financial turmoil.

The paper is structured as follows: in Section 2 we survey the literature on systemic risk, financial fragility and contagion; Section 3 presents descriptive statistics of the data; in Section 4 we explain the methodology for constructing the financial turbulence and the systemic risk measures; Section 5 discusses the results of the empirical analysis; and Section 6 concludes.

2. Literature review

The literature on systemic risk is related to that on contagion and financial fragility. In this section, we explore this literature by classifying the most relevant studies according to their focus on either developing indicators of market stress and financial turbulence, or directly measuring financial fragility.

Financial Turbulence

Chow, Jaquier, Lowrey and Kritzman (1999) proposed a measure of financial turbulence originally developed by Mahalanobis (1927). Their methodology addresses the instability of risk parameters in a portfolio allocation setting. The insight of this study is to identify multivariate outliers and use them to estimate a new covariance matrix. The authors claim that their method provides a better representation of a portfolio's riskiness during periods of market turbulence. However, their approach is suitable for portfolio allocation and does not concentrate on specifically identifying periods of market turbulence.

Kritzman and Li (2010) extend the research of Chow et al (1999) by investigating the empirical properties of financial turbulence and by demonstrating the application of this methodology to the stress testing of portfolios, to the construction of turbulence-resistant portfolios, and show how to scale exposure to risk to improve performance.

Financial turbulence has been modeled in the literature using other methodologies as well.

One problem that has been studied extensively is the asymmetry of correlations conditioned on upside and downside market conditions.

Ang and Chen (2002) find that correlations between domestic equity portfolios and the aggregate market are greater in downside markets than in upside markets. They develop a statistic to measure asymmetries in correlations which can be used to assess the extent

of correlation asymmetry in the data relative to any particular model. The authors examine several empirical models to establish if they can account for the correlation asymmetries in the data and find that the popular CAPM-based and GARCH-M models can produce asymmetric correlations, but of the wrong sign. They observe that regime-switching models perform best in explaining the amount of correlation asymmetry reflected in the data, but still leave a significant amount of correlation asymmetry unexplained.

Financial turbulence has also been studied using variants of the Generalized Autoregressive Conditional Heteroskedasticity model developed by Bollerslev (1986).

The seminal paper of Bollerselv (1986) introduces a generalization of the Autoregressive Conditional Heteroskedastic (ARCH) process to allow for past conditional variances in the current conditional variance equation. GARCH-type models based on various distributional assumptions have been developed and applied to the study of risk management problems, including the coupling of asset volatilities during periods of financial stress. Multivariate GARCH models have been developed to assess the behavior of correlations.

Markov regime-switching models are another class of models that are suitable for the study of turbulence in international financial markets.

Ang and Bekaert (2002) introduce regime-switching into a dynamic international asset allocation setting. They find evidence of the presence of a high volatility-high correlation regime which tends to coincide with a down-market. They reach the following three conclusions that are robust across all models used: (1) the existence of a high volatility regime does not cancel the benefits of international diversification; (2) the costs of ignoring regime switching are small for moderate levels of risk aversion; (3) the inter-temporal hedging demands under regime switches are economically negligible and statistically insignificant.

Mixture models, such as jump diffusions, have been used for the same purpose by researchers of international asset pricing.

Das and Uppal (2004) start from the observation that returns on international equities are characterized by jumps occurring at the same time across countries, leading to return distributions that are fat-tailed and negatively skewed. They develop a model that captures this stylized fact and show how an investor would choose an optimal portfolio when returns have these features. Their main result is that

systemic risk reduces only slightly the gains from international diversification implied in standard portfolio models.

Financial Fragility and Systemic Risk

Billio, Getmansky, Lo and Pelizzon (2010) show that correlations increase during market crashes. They propose several econometric measures of connectedness based on principal components analysis and Granger-causality networks, and apply them to the monthly returns of hedge funds, banks, broker/dealers, and insurance companies. Their findings suggest that these sectors have become highly interrelated, likely increasing the level of systemic risk in the finance and insurance industries. Their econometric techniques rely on principal components analysis and Granger-causality networks. They also claim that risk management practices based on Value-at-Risk may increase aggregate fluctuations if they are widely adopted.

Kritzman, Lowry, and Van Royen (2001) argue that the perception of risk as fully represented by the distribution of terminal wealth, together with the assumption of a single regime, leads to overconfidence. They apply a methodology to measure risk based on quiet or turbulent regimes that shows the extent to which the traditional measurement of risk understates exposure to loss. The forecasting procedure introduced in this article allows the assessment of the relative likelihood of quiet and turbulent regimes and provides a method to use this information to structure portfolios that are regime-sensitive.

Hyde, Bredin, and Nguyen (2007) study the correlation dynamics in equity markets of 13 Asia-Pacific countries, Europe and US using the asymmetric dynamic conditional correlation model introduced by Cappiello, Engle, and Sheppard (2006). They find that stocks exhibit asymmetries in conditional correlations in addition to conditional volatility. The authors claim that this feature is more prominent in more integrated markets. The findings support the hypothesis of increasing global market integration.

Cappiello, Engle, and Sheppard (2006) find strong evidence of asymmetries in conditional covariance of both equity and bond returns. They develop an asymmetric Dynamic Conditional Correlation model and show that it outperforms similar models that rely on the symmetry assumption. One of the interesting conclusion of their findings is that international diversification might not bring the benefits it is expected to during periods of global markets unrest.

They are also able to identify the "flight to quality phenomenon", where investors move capital from equities to less risky assets.

Ferreira and Gama (2004) show that the diversification effect is present for global industry returns. They propose a volatility decomposition method that is applied in an international setting in order to analyze the behavior of volatility in developed stock markets. The results suggest that the power of international diversification to reduce risk has not been eroded by the globalization process and claim that industry diversification has become relatively more efficient than geographic diversification. However, their data sample ends in 2001. More recent studies discussed above have shown that international diversification is less efficient during global markets turmoil and prolonged downturns.

Kritzman, Li, Page and Rigobon (2010) apply principal components analysis to several broad markets and estimate the fraction of the total market variance explained by a finite number of factors on a rolling basis throughout history, which they call the absorption ratio. They also introduce a standardized measure of shifts in the absorption ratio, and analyze how these shifts relate to changes in asset prices and financial turbulence. They show that stock returns are much lower, on average, following spikes in the absorption ratio than they are in the wake of significant declines in the absorption ratio. They also demonstrate that the absorption ratio has been a leading indicator for the housing bubble in the United States, and also that the time series of the absorption ratio closely track the evolution of other measures of financial contagion.

Berger and Pukthuanthong (2012) argue that the probability of a worldwide financial crash is at its peak during periods when many countries are exposed to the world market factor. They develop a risk measure defined as the average loading on the world factor across countries at a point in time and link this measure to systemic risk. The systemic risk indicator introduced in this paper is similar to that proposed by Kritzman et al (2010).

Kinlaw, Kritzman, Turkington (2012) use the absorption ratio defined by Kritzman et al (2010) to develop an algorithm for measuring systemic importance of financial institutions. The algorithm captures an asset's riskiness and connectivity to other risky assets during periods of high systemic risk. Their findings suggest that entities associated with finance, energy and technology are the most systemically important. They also provide a ranking of global financial

institutions based on their vulnerability to failure and connectivity to other risky entities.

Benoit, Colletaz, Hurlin, Perignon (2013) propose a theoretical and empirical comparison of the most popular systemic risk measures. They derive the systemic risk measures in a common framework and show that they can be expressed as linear transformations of firms' market risk. They also show how the systemic risk measures can be used to rank global financial institutions according to their systemic importance. The conclusions of this study suggest that systemic risk is multi-faceted and that no single systemic risk measure can be used to capture its multiple facets.

We extend the methodology proposed by Kritzman and Li (2010) by identifying turbulence periods that have been observed between January 2000 and July 2015 in European stock markets, and calculate the time series of the absorption ratio defined Kritzman, Page, Li, and Rigobon (2010) in order to show that it is a leading indicator of periods of financial turmoil in this region, both at the aggregate level and for individual countries.

3. Data

The data used to calculate the financial turbulence indicator and the time series of the absorption ratio has been sourced from Thomson Reuters Datastream. The data includes the Datastream country equity indices for 26 countries in the European Union, as well as the Datastream industry equity indices for each country, for as many as 9 industries: Oil and Gas, Basic Materials, Industrials, Consumer Services, Healthcare, Telecommunications, Utilities, Financials, Technology. The levels of the index series have be transformed to log-returns before any calculation was performed. The sample period is January 1, 2000 to July 31, 2015. Descriptive statistics of the country equity index returns are given in Table 1.

Table 1

Descriptive statistics of Datastream equity indices returns

	Mean	Std. dev.	Max.	Min.	Skewness	Kurtosis
Austria	0.02%	1.17%	9.69%	-8.10%	-0.42	11.13
Belgium	0.03%	1.17%	8.24%	-8.13%	-0.13	8.77
Cyprus	-0.08%	1.79%	12.90%	-11.84%	-0.10	7.39
Estonia	0.04%	1.41%	9.62%	-9.18%	-0.02	8.06

	Mean	Std. dev.	Max.	Min.	Skewness	Kurtosis
Finland	0.00%	1.91%	15.35%	-18.24%	-0.39	11.11
France	0.02%	1.32%	9.94%	-8.41%	-0.05	7.69
Germany	0.01%	1.27%	16.06%	-7.79%	0.24	13.07
Greece	-0.05%	1.85%	12.47%	-15.61%	-0.11	9.22
Ireland	0.02%	1.36%	9.13%	-13.34%	-0.58	10.20
Italy	0.01%	1.36%	10.51%	-8.61%	-0.16	7.72
Lithuania	0.03%	1.06%	12.73%	-11.62%	-0.19	19.06
Luxemburg	0.02%	1.07%	10.14%	-6.81%	-0.09	9.29
Malta	0.02%	0.79%	7.30%	-6.34%	0.27	12.67
Netherlands	0.01%	1.31%	9.32%	-9.20%	-0.25	9.09
Portugal	0.00%	1.11%	9.52%	-10.54%	-0.26	10.43
Slovakia	0.02%	0.89%	8.14%	-18.02%	-3.00	85.38
Slovenia	0.02%	0.94%	8.17%	-8.33%	-0.49	12.75
Spain	0.02%	1.34%	11.77%	-8.47%	0.04	7.59
Bulgaria	0.05%	1.75%	29.10%	-31.20%	-1.49	70.46
Croatia	0.02%	1.16%	11.76%	-8.89%	0.23	19.43
Cz. Rep.	0.05%	1.45%	17.32%	-14.55%	-0.19	16.66
Hungary	0.01%	1.78%	15.38%	-18.68%	-0.13	11.11
Poland	0.02%	1.63%	10.37%	-10.34%	-0.24	6.66
Romania	0.04%	1.90%	12.30%	-13.33%	-0.53	9.86
Sweden	0.02%	1.71%	11.38%	-8.86%	0.00	6.53
UK	0.01%	1.26%	9.02%	-8.91%	-0.16	9.04

Source: Thomson Reuters Datastream, author's calculations

4. Methodology

4.1. Principal Components Analysis

Principal Components Analysis (PCA) has many applications to risk and finance problems. A technical overview of the method is given in Jolliffe (2002). There are several studies using PCA in the context of measuring systemic risk, including Kritzman, Li, Page and Rigobon (2010) and Billio, Getmansky, Lo, and Pelizzon (2010).

Given a covariance matrix of asset returns estimated over a particular period, the first eigenvector is a linear combination of asset weights that explains the greatest percentage of the asset's total variance. The second eigenvector is orthogonal to the first and constructed in the same manner. That is, it is the eigenvector that explains most of what is left of the assets total variance. The third, fourth and subsequent eigenvectors are determined using the same

procedure until all the variance is explained[2]. In practice, however, we need not concern ourselves with explaining all of the variance. The first few eigenvectors often suffice.

In some cases, it is useful to find an economic interpretation of the first few eigenvectors. It may be the case that they are closely correlated with meaningful economic variables, when these variables are certain to affect a particular set of assets. In other cases, the eigenvectors may reflect the combined influence of several factors, making it difficult to interpret from an economic point of view.

Kritzman et al. (2010) introduce a measure of systemic risk which they title the Absorbtion Ratio (AR). The ratio is defined as the fraction of the total variance of a set of asset returns explained or "absorbed" by a fixed number of eigenvectors. The economic interpretation of the AR rests on the fact that the ratio shows whether markets are unified. When they are, negative shocks propagate more easily and more broadly then when markets are decoupled.

4.2. Construction of the Absorption Ratio

Definition

The construction of the Absorption Ratio relies on the covariance matrix of a set of asset returns. Given *N* assets and the *N x N* covariance matrix, the AR is defined as:

$$AR = \frac{\sum_{i=1}^{n} \sigma_{E_i}^2}{\sum_{j=1}^{n} \sigma_{a_j}^2}$$

where

n = number of eigenvectors used in calculating AR

$\sigma_{E_i}^2$ = variance of eigenvector *i*

$\sigma_{a_j}^2$ = variance of asset *j*

There is a link between the level of the absorption ratio and systemic risk. When the AR is at high levels, sources of risk are more

[2] The number of eigenvectors will not exceed the number of assets in the sample.

unified. The authors note that high systemic risk is not necessarily an indication of unavoidable asset depreciation or financial turbulence. Instead, higher systemic risk represents a higher degree of fragility in financial markets. It is important to note that, even though the AR measure is based only on stock market data, it has behaved in the past as a leading indicator for the housing bust preceding the subprime mortgage crisis in the United States of America, as well as for other crises of the past decade, as shown in Kritzman et al. (2010).

The authors also propose a technical indicator of AR movements, named the AR shift, which they claim to be a leading indicator of severe downturns in asset prices. The indicator is based on the difference between short-term and long-term moving average of the AR time series, standardized by the long-term standard deviation.

$$\Delta AR = \frac{AR_{15-Day} - AR_{1-Year}}{\sigma_{AR_{1-Year}}}$$

where

ΔAR = standardized AR shift

$\overline{AR}_{15-Day}$ = 15-day moving average of AR

$\overline{AR}_{1-Year}$ = 1-year moving average of AR

$\sigma_{AR_{1-Year}}$ = standard deviation of the 1-year AR

4.3. Financial Turbulence Indicator

Kritzman and Li (2010) define “financial turbulence” as a condition in which asset prices, given their time series history, display uncharacteristic behavior, including extreme price movements, decoupling of correlated assets, and convergences of uncorrelated assets. They employ the Mahalanobis distance (Merton, 1937) to measure the statistical peculiarity of a set of asset returns given their history.

Mahalanobis distance for a sample of *n* assets is defined as:

$$d_t = (\mathbf{y_t} - \mathbf{m})' \mathbf{\Sigma^{-1}} (\mathbf{y_t} - \mathbf{m})$$

d_t = turbulence at time *t*

$\mathbf{y_t}$ = (n x 1) vector of asset returns

$\mathbf{m}$ = (n x 1) sample average vector of asset returns

$\mathbf{\Sigma}$ = (n x n) sample covariance matrix of asset returns

We use the above definition to generate the daily time series of d_t and define "turbulent" periods the days for which d_t is above its 90th percentile. The Mahalanobis distance has applications in stress testing asset portfolios. Kritzman and Li (2010) propose the calculation of VaR based only on turbulent periods instead of the full sample. They claim that the turbulence-adjusted VaR better reflects asset correlations and returns during a turbulent states and is therefore a more realistic estimate of possible losses arising from a systemic event.

5. Results

5.1. Turbulence

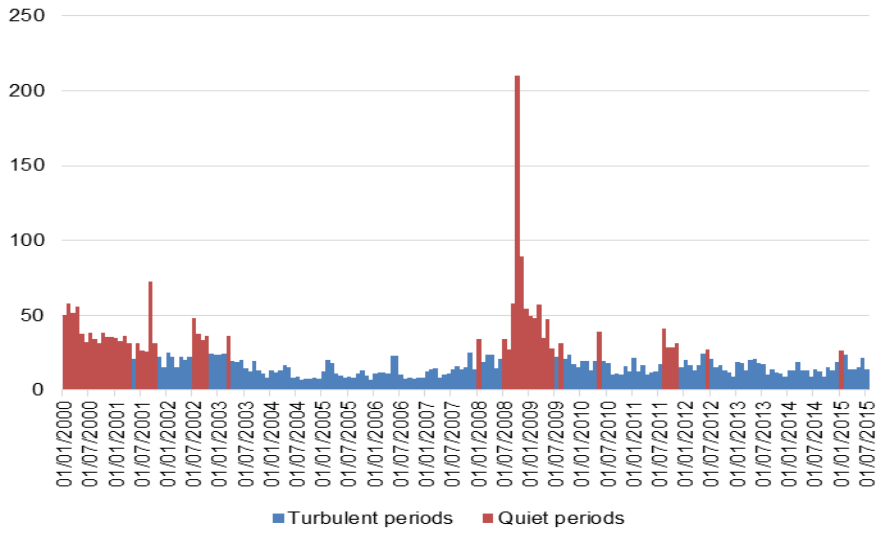
The measurement of financial turbulence using the Mahalanobis distance proposed by Kritzman and Li (2010) is appealing in its simplicity and, as we will see below, a useful measure for determining periods of unrest in financial markets. We compute the time series of this indicator and illustrate its evolution through time in Figure 1. In Tables 2a, 2b and 2c we summarize the most significant events that took place during what have been named the US subprime mortgage crisis, the Eurozone debt crisis and the Russia-Ukraine conflict. These globally significant crises have triggered responses in stock prices across the EU and prompted unprecedented government intervention, which had an impact on movements in asset prices and may have had direct consequences in creating financial fragility, thus increasing systemic risks.

Given the series of financial turbulence in Figure 1, we may pinpoint the events that have had the most serious impact, leading to spillovers or financial contagion. It is interesting to observe that the turbulent periods shown in Figure 1 in red correspond, by construction, to the top 10 percent increases in the financial turbulence indicator. Their connection to actual economic, political or market events will be determined qualitatively, using information in Table 2a, 2b and 2c. Another aspect that is worth mentioning refers to

the intuition behind selecting the 10 percent threshold. In their article, Kritzman and Li (2010) denote quiet periods as those falling within 75 percent of the distribution, and therefore choose a 25 percent threshold. However, using the same value would have generated a larger sample of "turbulent" periods. We chose to concentrate only on the most severe of the spikes in the turbulence indicator in order to capture the usefulness as a leading indicator of the Absorption Ratio, which will be discussed in the next section, as the first two sections are linked.

Figure 1

Turbulence indicator



Periods of turbulence calculated at 90% threshold are shown on the figure in red.
Source: author's calculations

The 10 percent most turbulent periods identified using the Mahalanobis distance are June, 2000 to October, 2001, July, 2002 to October, 2002, March, 2003, January, 2008, July, 2008 to August, 2009, May, 2010, August, 2011 to November, 2011, June, 2012 and January 2015.

In Table 2a we summarize the events that span the subprime mortgage crisis. *Post factum*, it is obvious that the crisis in the United States started in February 2007. The subsequent events have had a profound negative impact on stock prices in the United States. The

turbulence indicator, which is based only on data for European stock markets, does not seem to react strongly at the beginning of the crises in the United States. Spillovers are contained until January 2008, when we record the first sharp increase in the value of the indicator. Until that point, the relevant events take place in the United States. The run on the UK bank Northern Rock, which took place on September 14, 2007, preceded by the increase of LIBOR to a seven-year high, generated a spike in the series, but not large enough to count September 2007 as one of the most turbulent 10 percent of months in the sample.

The actual start of financial turbulence in Europe seems to be in July 2008, which corresponds to the announcement by the Nationwide Building Society, Britain's fourth-biggest mortgage lender, that UK house prices declined the most in almost two decades in July and consumer confidence fell to record low. This is immediately followed by the decision of UBS AG, the largest Swiss bank, to separate its investment banking and wealth management units after mounting subprime writedowns prompt rich clients to withdraw funds for the first time in eight years. The Lehman Brothers Holdings Inc collapse happens in September 2008, followed at the end of the month by a bailout of Forits, the largest Belgian financial-services firm, by Belgium, the Netherlands and Luxembourg governments. September also sees the rescue of Dexia SA in Ireland, the acquisition of Fortis by BNP Paribas SA, together with significant policy interventions in the US to prop up the financial system. October 2008 is thus the month where the financial turbulence index reaches its peak.

Table 2a

Timeline of events during the US subprime crisis

Feb. 27, 2007	Freddie Mac announces that it will no longer buy subprime loans
Apr. 2, 2007	Subprime mortgage lender New Century Financial files for bankruptcy-court protection
Jul. 31, 2007	Investment bank Bear Sterns liquidates two hedge funds that invested in subprime mortgage backed securities
Aug.6, 2007	American Home Mortgage Investment files for bankruptcy protection
Jul 19, 2007	Federal Reserve Chairman Ben Bernanke informs the US Senate of expected $100 billion in losses associated with subprime mortgage products

Aug 9, 2007	BNP Paribas SA announces that it is unable to fairly value the holdings of three investment funds and halts all withdrawals
Aug 22, 2007	Countrywide Financial Corp., the largest US mortgage lender, sells $2 billion preferred stock to Bank of American
Sept 7, 2007	The 3m LIBOR rises to seven-year high
Sept. 14, 2007	Northern Rock Plc. announces that Bank of England agreed to provide emergency funds to ease severe liquidity freeze following bank run
Oct. 9, 2007	US stock markets bounce back after Federal Reserve alleviates fears that the economy is heading into recession
Oct. 30, 2007	Merrill Lynch & Co. fires chairman and chief executive officer after reporting $2.24 billion loss
Nov. 4, 2007	Citigroup increases its estimate of losses for mortgage-related writedowns
Jan. 11, 2008	Bank of America agrees to buy Countrywide for $4 billion
Mar. 14, 2008	Bear Sterns Cos. receives emergency funding from the US Federal Reserve and JPMorgan Chase & Co. following run on the bank
Mar. 16, 2008	JPMorgan Chase agrees to buy Bear Sterns
Apr. 1, 2008	Lehman Brothers Holding Inc. raises $4 billion from a stock sell
Apr. 9, 2008	Washington Mutual Inc. rejects offer from JPMorgan chase before announcing it received $7 billion capital infusion
May 31, 2008	Acquisition by JPMorgan of Bear Sterns is complete
Jul. 11, 2008	Run by depositors on IndyMac Bancorp Inc prompts federal regulators to seize control
Jul. 31, 2008	UK's fourth-biggest mortgage lenders, Nationwide Building Society announces that home prices dropped the most in two decades and consumer confidence fell to record low
Aug. 12, 2008	Switzerland's UBS AG announces plans to separate investment banking and wealth management units
Aug. 31, 2008	Commerzbank AG agrees to buy Allianz SE's Dresdner Bank for 9.8 billion euros
Sep. 7, 2008	US government seizes control of Fannie Mae and Freddie Mac, the largest US mortgage-finance companies
Sep. 15, 2008	Lehman Brothers Holding Inc. files for bankruptcy and Bank of America agrees to acquire Merrill Lync for about $50 billion.
Sep. 16, 2008	American International Group Inc. receives $85 billion loan from the Fed and the government takes over the company
Sep. 18, 2008	Lloyds TSB Group Plc agrees to buy HBOS Plc, Britain's largest mortgage lender, for 10.4 billion pounds

Sep. 21, 2008	Goldman Sachs and Morgan Stanley are approved by the Fed to become commercial banks
Sep. 23, 2008	Goldman Sachs raises $7.5 billion from Berkshire Hathaway Inc. and public investors
Sep. 26, 2008	Washington Mutual is seized by government regulators while its branches and assets are sold to JPMorgan Chase
Sep. 27, 2008	Washington Mutual files for bankruptcy protection.
Sep. 28, 2008	The largest Belgian financial-services firm, Fortis, receives 11.2 billion euro from Belgium, the Netherlands and Luxembourg
Sep. 29, 2008	Citigroup agrees to acquire the banking operations of Wachovia Corp. for about $2.16 billion. The House of Representatives rejects $700 billion plan to rescue US financial system
Sep. 30, 2008	Dexia SA receives 6.4 billion euro state-backed rescue, while Ireland pledges to guarantee the bank's deposits and debts for two years
Oct. 1, 2008	US Senate approves revised version of rescue plan
Oct. 3, 2008	The House of Representatives passes the revised version of the rescue plan
Oct. 5, 2008	BNP Paribas SA, would take control of Fortis's units in Belgium and Luxembourg after government rescue had failed
Oct. 6, 2008	German government and the country's banks and insurers agree on a 50 billion euro rescue package for commercial property lender Hypo Real Estate Holding AG after earlier bailout fails
Oct. 12, 2008	European leaders agree to guarantee bank borrowing and use government money to prevent the failure of big lenders

Source: compiled by the author from various media sources, including Bloomberg.com and usatoday.com

The most turbulent period in recent history ended in August 2009. A new spike in financial turbulence was recorded in May 2010. It is interesting to note that the Eurozone debt crisis had already started in October 2009, with the appointment of George Papandreou as Greek Prime Minister. The events that followed revealed the dire situation of Greek finances and prompted the rating agencies to downgrade Greek sovereign debt to below investment grade already in December 2009. At the time, however, the probability of the crisis that would ensue was deemed low by market participants. The first reaction came in May 2010, when the Greek government reached a deal with the IMF and Eurozone leaders for a 110 billion euro bailout package. The next phase of the crisis, accompanied by increased financial fragility, came in August 2011, when Italian government bond yields surpassed the 6 percent threshold. Even the remote

possibility of an Italian default was enough to generate concerns among market participants about the sustainability of sovereign debt of Eurozone member states, especially of the periphery countries. The turmoil ended in December 2011, with the extension of a substantial loan facility by the European Central Bank to 500 European banks. Another episode of turmoil was in June 2012, when a Greek exit from the Eurozone first became a real possibility. The last turbulence period in our sample was recorded in January 2010 and corresponds to the decision of the Swiss National Bank to abandon the Swiss franc peg to the Euro, followed by the introduction of the quantitative easing program by the European Central Bank.

Table 2b

Timeline of events during the Eurozone Debt Crisis

Oct. 2009	Leader of the Greek party PASOK, George Papandreou, is sworn in as prime minister
Nov. 2009	Papandreou's administration brings to light misleading accounting by preceding Greek government. Corrected figures show a budget deficit of 12.7 percent of GDP
Dec. 2009	Rating agencies Fitch and Standard & Poor's downgrade Greece's credit rating to below investment-grade status
Feb. 2010	Greek government announces austerity plan to reduce deficit by ten percent by 2012. Spanish Prime Minister announces austerity plan that would increase retirement age from 65 to 67.
Mar. 2010	Leaders of the Eurozone and the IMF agree on deal to provide financial support for Greece.
Apr. 2010	Greek budget deficit reaches 13.6 percent, Standard & Poor's downgrades Greek government bonds to junk
May 2010	Greek government, the IMF and Eurozone leaders agree to 110 billion euro three-year bailout package for Greece. EU and IMF create 750 billion euro emergency fund
Sep. 2010	Ireland's central bank announces that the cost of bailing out Anglo Irish Bank could amount to 34.3 billion euro, raising Ireland's budget deficit to 32 percent of GDP.
Nov. 2010	85 billion euro rescue package is approved for Ireland
Feb. 2011	European finance ministers announce the creation of European Stability Mechanism (ESM), a permanent 500 billion euro fund to be used as last

	resort for Eurozone economies
Mar. 2011	Fitch and Standard & Poor's cut ratings of Portuguese sovereign debt
May 2011	European leaders approve 78 billion euro bailout package for Portugal in exchange for commitment to austerity program
Jun. 2011	Standard & Poors downgrades Greece's sovereign rating to CCC
Jul. 2011	European leaders extend additional rescue package to Greece amounting to 109 billion euro and restructure Greek loans with more generous terms.
Aug. 2011	Interest rates on 10-year Italian government bonds top 6 percent
Sep. 2011	The Swiss National Bank devalues the franc and pegs its value to that of the euro
Oct. 2011	Greek parliament approves new austerity measures. Eurozone leaders discuss bond swap that would cut the value of Greek debt in half. Papandreou calls for a referendum on latest EU bailout plan.
Dec. 2011	European Central Bank extends 489 billion euro in loans to more than 500 European banks to prevent credit freeze.
Feb. 2012	Moody's cuts the debt ratings of six European countries, including Italy, Portugal and Spain, and downgrades economic outlook on France and the United Kingdom. About 800 European banks use ECB's second long-term refinancing operation, which injects an additional 530 billion euro into the banking system.
Mar. 2012	25 EU countries sign a new pact on fiscal discipline. The UK and the Czech Republic opt out entirely. Eurozone leaders announce the expansion of the EFSF and ESM giving them access to a combined 800 billion euro in funding.
May 2012	Market analysis begin to discuss a Greek exit from the Eurozone.
Sep. 2012	Germany's Federal Constitutional Court authorizes the ratification of the European Stability Mechanism.
Mar. 2013	Cyprus negotiates 10 billion euro bailout agreement with international lenders. Bank of Cyprus customers lose 47.5 percent of deposits that are over 100,000 euro.
Jun. 2014	The ECB cuts its deposit rate to -0.1 percent in an effort to increase lending
Jan. 2015	Switzerland abandons its three-year peg to the euro ECB Governor Mario Draghi announces the creation of a 1.1 trillion euro quantitative easing program to boost euro-zone growth.

Jun. 2015	Greece defaults on IMF payment
Jul. 2015	Even though Greek voters back Prime Minister Alexis Tsipras by rejecting the latest bailout terms in a referendum, Greece finally agrees to most bailout conditions by the end of the month, thus averting Grexit.

Source: compiled by the author from various media sources, including Britannica.com

The Russia-Ukraine conflict, which was significant at a political level, has not been a trigger of increased systemic risk and financial fragility in European Union Member countries. Throughout 2013 and 2014, the financial turbulence indicator remained at low levels. The effects of the conflict were felt more in the fluctuations of exchange rates of non-Eurozone member states. This fact is consistent with the interpretation that regulatory and policy measures implemented before the start of the conflict, such as the creation of the European Stability Mechanism or the pledge by the European Central Bank governor Mario Draghi to "do whatever it takes" to preserve the Euro have been effective in mitigating systemic risk and increasing the resilience of the financial system.

Table 2c

Timeline of Ukraine crisis

Dec. 1, 2013	Ukrainian police break up student protest camp in Kiev's Independence Square over president Viktor Yanukovich's failure to sign trade deal with EU
Feb. 20, 2014	Police and protesters clash in Kiev
Feb. 22, 2014	Ukraine's president flees Kiev
Feb. 27, 2014	Government buildings are seized up in Simferopol, the capital of Ukraine's Crimea peninsula
Mar. 18, 2014	Russia's president Vladimir Putin signs a law incorporating Crimea into Russia
Apr. 7, 2014	Protesters seize government buildings in Kharkiv, Donetsk and Luhansk in Eastern Ukraine.
May 25, 2014	Petro Poroshenko is elected president of Ukraine
Jun. 27, 2014	EU signs trade deal with Ukraine
Jul.17, 2014	Malaysia Airlines Flight MH17 is shot down in Eastern Ukraine
Jul. 31, 2014	EU agrees to economic sanctions, restricting access of Russian banks and oil companies to Western financing

Sep. 5, 2014	Peace deal signed in Belarus over conflict in Eastern Ukraine
Jan. 31, 2015	Peace talks collapse in Minsk

Source: compiled by the author from various media sources, including telegraph.co.uk

The analysis of the three crisis episodes outlined above has shown that the financial turbulence indicator is a reliable measure of systemic risk. We will use this indicator to check the ability of the Absorption Ratio to pinpoint future downturns and thus act as a leading indicator.

5.2. Absorption Ratio

Absorption Ratio at the aggregate EU level

Figure 2 shows the time series of the absorption ratio (AR) estimated from the returns of EU markets equity indices based on 500 day overlapping windows, along with the level of the Datastream aggregate equity index of EU markets from December 2001 to July 2015. The results of the analysis are similar to those obtained by Kritzman et al. (2010) for the US market. There is a clear inverse relationship between the AR and the level of the index. Moreover, the AR ratio reached its peak after June 2008, although it had been trending upwards since June 2006. As mentioned in section 5.1., the AR ratio estimated for Europe should lag behind the AR ratio estimated for the United States because the spillovers from US to the EU during the subprime mortgage crisis happened over a period of a few months. However, the EU AR ratio should display a characteristic pattern around the Eurozone debt crisis, which has been felt more severely in Europe than in the United States. Another interesting observation from this chart is the drop of the AR ratio to its lowest level in the sample from December 2012 to December 2014, which points to a reduction in systemic risk during this period marked by relative calmness after fears of a sovereign default in Europe had subsided. The subsequent rise of the ratio from December 2014 to the end of the sample, in July 2015, exposes the increased fragility of the European financial system. The causes of this increase may relate to the recent development in sovereign debt markets and the uncertainty surrounding the Greek agreement for an extension of the bailout package. As we will show in the next sections, the AR ratio can be viewed as a leading indicator of financial turmoil. For this reason, supervisory authorities and regulators entrusted with

monitoring systemic risk should be on the lookout for events that may trigger a new crisis episode.

Figure 2

Absorption ratio and European stock prices

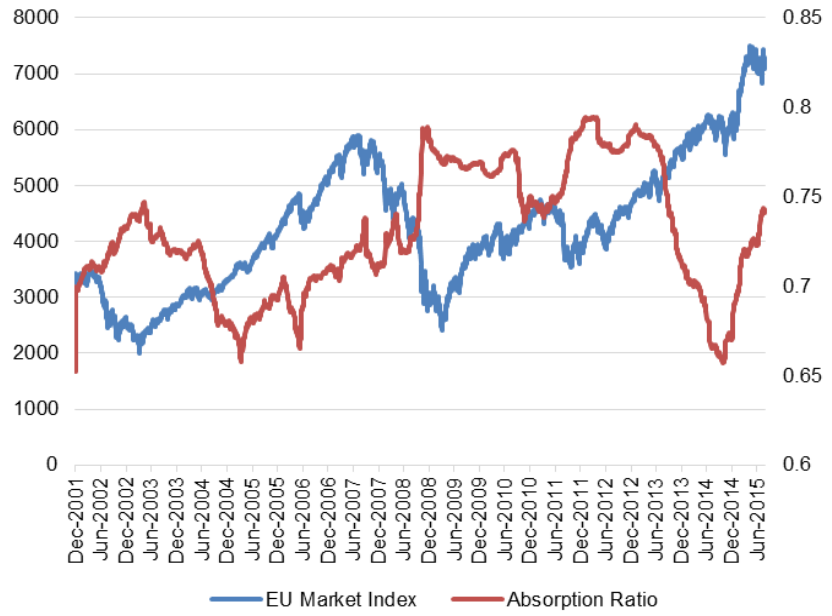


Figure shows absorption ratio based on equity index returns of EU countries and the aggregate value-weighted EU market index. *Source: author's calculations*

The AR shift has been defined in Section 4.2. To calculate the AR shift, we first compute the moving average of the absorption ratio over 15 days and subtract it from the moving average of the absorption over one year. We then divide the difference by the standard deviation of the one-year absorption ratio. Similar to Kritzman et al (2010), we analyze how the aggregate EU stock market performs following a one standard deviation move of the AR ratio, as measured by the AR shift. That is, we identify the periods when the absolute value of the AR shift, computed over rolling windows of one year, first surpasses the value of 1, and then look at the behavior of the aggregate EU markets index returns over a 1-day, 1-week or 1-month horizon. If the AR is indeed a leading indicator of crisis episodes, we would expect returns to be on average negative following an increase of the AR shift (to more than 1) and positive

otherwise (to below -1). Table 2 shows that this behavior is indeed present at all horizons when the AR shift increases suddenly. In the case when the AR shift decreases below -1, the expected behavior is only present at 1-day and 1-week horizons. Because this analysis is not rigorous from a statistical point of view, it is useful to also study the AR as a leading indicator in a different context.

Absorption Ratio as a leading indicator

Table 2

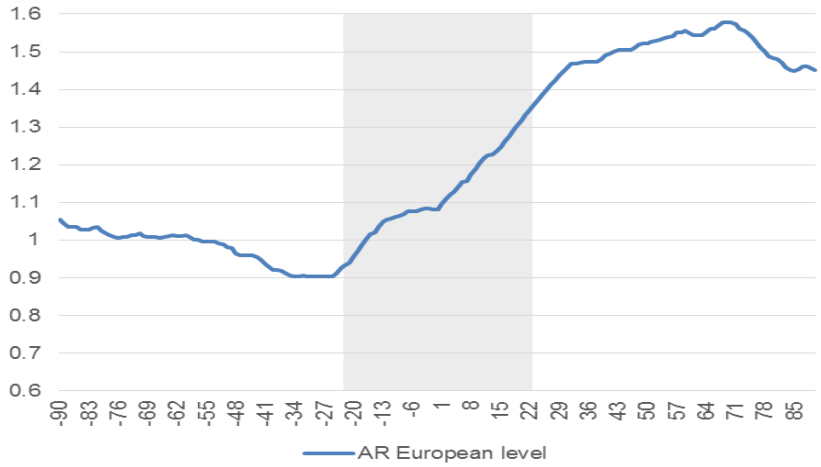
EU equity index return after extreme movements in AR

	1 Sigma Increase	1 Sigma Decrease	Difference
1-day	-0.24%	1.58%	11.91%
1-week	-0.08%	0.61%	4.41%
1-month	-0.03%	-0.08%	0.33%

We can study the ability of the AR ratio to act as a leading indicator by first identifying the turbulent periods as described in Section 5.1. In order to measure the link between systemic risk and financial turbulence, we synchronize all the turbulent events identified previously and observe changes in the 15-day absorption ratio relative to one-year absorption ratio estimated from country index returns. Figure 3 is a summary of this event study. Prior to turbulent events in the stock markets (the start of the event is at 0 in the Figure), the median of the AR shift starts to increase beginning around 20 days in advance of the event, and then starts falling after around 80 days. In terms of trends, the results for the European markets are similar to those presented by Kritzman et al. (2010) for the United States. However, they find that the AR shift signals trouble beginning about 40 days before the turbulent event.

Figure 3

Median absorption ratio around turbulent periods



Source: author's calculations

Analysis of the Absorption Ratio at individual country level

The previous subsection analyzed the performance of the absorption ratio calculated based on the returns of EU countries stock market indices. The results show that the AR is a potential leading indicator of financial crises. We study next the behavior of the absorption ratio calculated for each EU country out of its industry equity returns. In Figure 4a we plot the absorption ratio for all countries in the sample (conditional on data availability). In order to make the results comparable, we first normalize the series by dividing the difference between AR recorded for each country in a period and the minimum of the country's full sample to the range (difference of maximum and minimum) over the full sample period. Since the level of the AR is less important than its variation, this procedure offers a better picture of the ability of the indicator to signal crisis episodes. We observe that for most of the countries represented in Figure 4a, the AR started to change color already in Q2 2008. However, it appears that over the next quarters, the AR remained at higher levels for most countries compared to its historical performance. The pattern is markedly different from that of the financial turbulence indicator presented in Figure 1.

Figure 4a

Heatmap of normalized absorption ratios calculated for each country out of industry equity indices

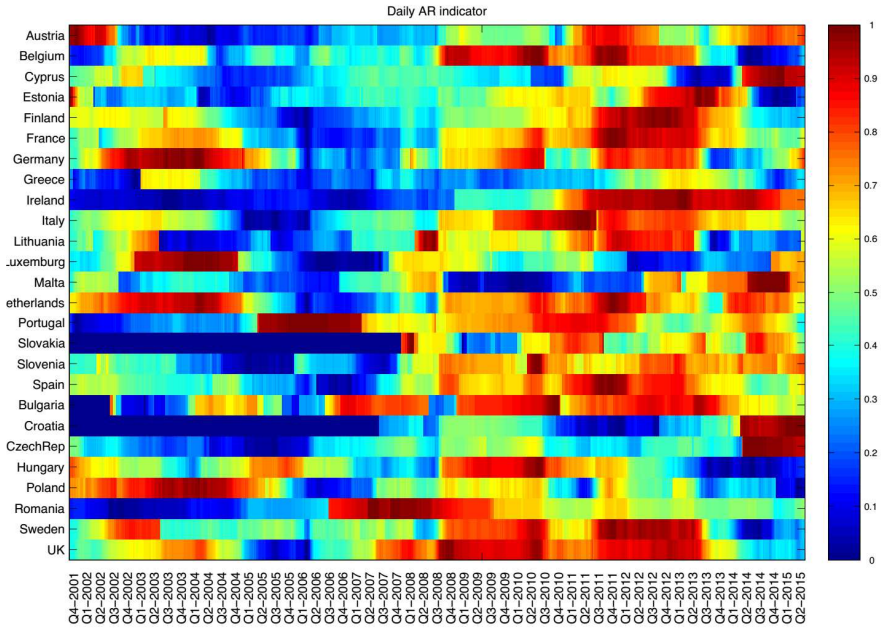


Figure shows normalized absorption ratios calculated over the period Dec. 2001 – Junl. 2015 for all countries in the sample, based on Datastream industry equity indices described in Table 1. *Source: author's calculations*

Figure 4b shows the evolution in time of the AR shift for all the countries in the sample. The AR shift displays a more interesting pattern and appears to be a leading indicator of all the crises episodes. The pattern of the AR shift is consistent with that of the turbulence indicator. By disaggregating the data, we can assess the impact of significant events on different countries. We can see, for instance, that Eurozone countries have experienced increased systemic risk and financial fragility, while countries relying on their own currencies have been somewhat protected. Developed countries such as Austria, Belgium, France, Germany, Greece, Ireland, Italy, Luxemburg, the Netherlands, Portugal, Spain and the UK have recorded higher levels of the AR shift between 2010 and 2012, during the Eurozone debt crisis, then countries like Croatia, the Czech Republic, Hungary, Poland, and Romania. Also worth mentioning, Austria, Cyprus, Luxemburg, Malta, Portugal, Slovakia, Bulgaria and

Croatia appear to record higher levels of financial fragility starting with the beginning of 2014.

Figure 4b

Heatmap of AR shift calculated for each country out of industry equity indices

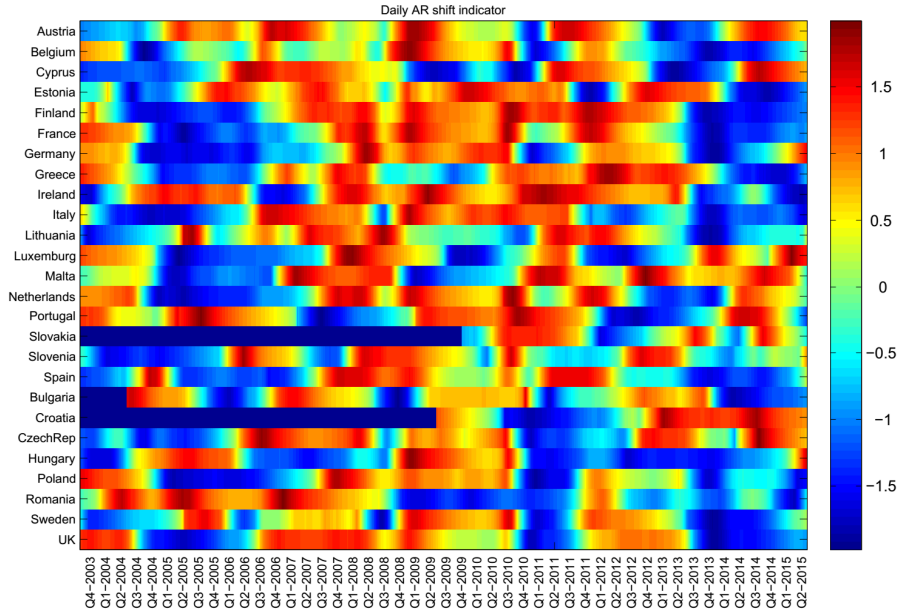


Figure shows AR shift calculated over the period Dec. 2001 – Junl. 2015 for all countries in the sample, based on Datastream industry equity indices described in Table 1. *Source: author's calculations*

In the previous subsection, we studied the pattern of the AR ratio estimated for each country in the sample based on the returns of its industry equity indices. In this section, we analyze the performance of the AR ratio as a leading indicator by applying the same method as in the aggregate case. We use the same turbulent periods that have been identified using the Mahalanobis distance with a 90 percent threshold. The financial turbulence indicator captures turmoil at the European level. It shows when stock prices in the European Union behaved in an uncharacteristic fashion, including extreme price movements, decoupling of correlated assets and convergence of uncorrelated assets (Kritzman and Li, 2010). We ask in this subsection how individual countries experienced the EU-wide

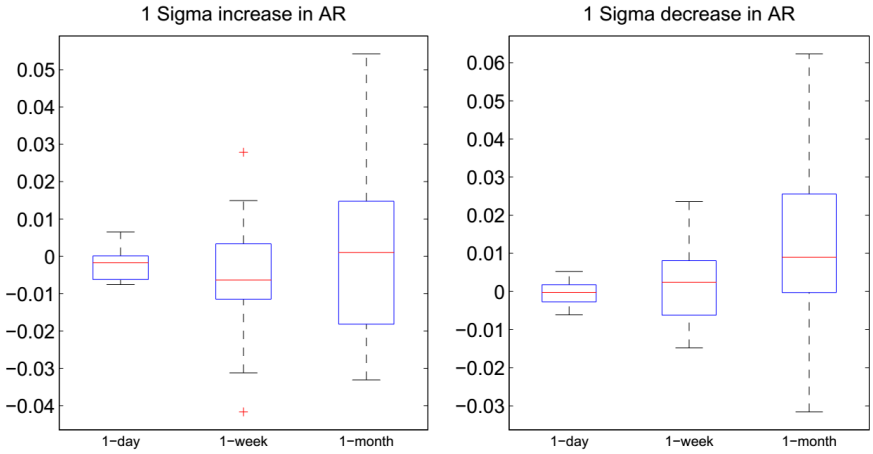
turbulence. Is the AR computed from industry index returns, expressed in local currency, still a leading indicator for individual countries in the sample, or is this property only present at the aggregate level?

In Table 3 we show the mean returns at 1-day, 1-week and 1-month horizons of the individual country equity index, following changes of more than one standard deviation in the difference between the 15-day moving average AR ratio and the 1-year moving average AR ratio. On average, following an increase in the AR ratio, index returns have been negative at all horizons and following a decrease in the AR ratio index returns have been positive. In the cases of Estonia, Finland, Ireland, Lithuania, Slovenia and Spain, the behavior has been consistent with the hypothesis that the AR is a leading indicator of financial crises. In the case of France, Greece, Malta, the Netherland, Croatia and the UK, the index returns have been negative at all horizons following a one-sigma increase in the AR. However, a decrease in the AR has not led in this countries to an average increase in returns at all horizons.

Figure 5 provides a better picture of the results in Table 3. We show in this picture the boxplots of returns following one-sigma increases and decreases of the AR ratio. We observe that the cross-country distributions of returns are positively skewed in the case of an increase and negatively skewed in the case of a decrease. The variance of the cross-country returns also grows as we move from the 1-day horizon to the 1-month horizon, which is to be expected. But the distribution shows clearly, in our view, that the absorption ratio has predictive power even at individual country level. The variation could be explained by the fact that some countries are more resilient than others to global or Europe-wide shocks. In other words, the build-up of systemic risks in these countries is less noticeable during crisis episodes because their financial systems are more resilient. We also mention here the arbitrary nature of choosing return horizons. To account for this fact, we study in the next subsection the behavior of the AR shift around turbulent periods for all countries in the sample.

Figure 5

Boxplots of returns following significant increases in AR



The figure illustrates the results in Table x, showing the distribution of country index returns at different horizons (1 day, 1 week and 1 month) following an increase (left) or decrease (right) in the AR of more than one standard deviation, as measured by the AR shift. *Source: author's calculations*

Table 3

Country stock market index reaction after 1 standard deviation increase or decrease in the absorption ratio

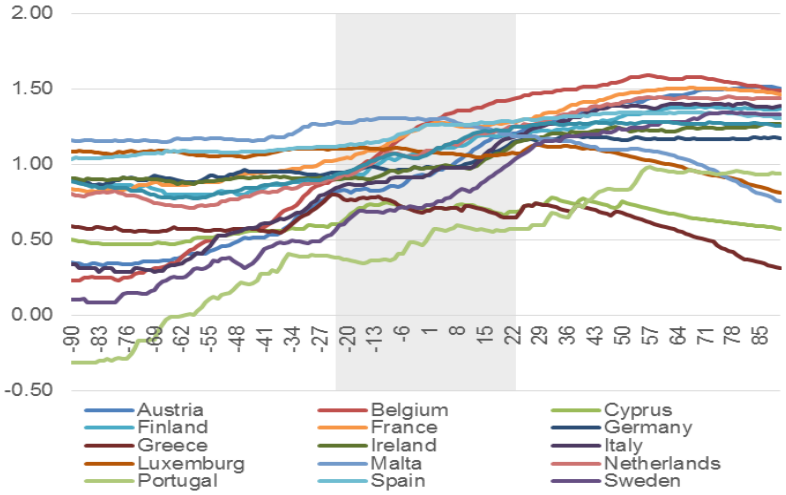
	1 Standard Deviation Increase			1 Standard Deviation Decrease		
	1-day	1-week	1-month	1-day	1-week	1-month
Austria	-0,2%	0,2%	0,7%	0,0%	0,2%	0,5%
Belgium	0,0%	-4,2%	3,1%	-0,5%	0,0%	0,5%
Cyprus	0,6%	0,3%	0,7%	-0,3%	-0,2%	1,1%
Estonia	-0,3%	-1,3%	-3,1%	0,4%	2,2%	4,6%
Finland	-0,2%	-1,1%	-1,7%	0,4%	1,6%	3,5%
France	-0,8%	-3,1%	-2,6%	-0,3%	-0,8%	1,4%
Germany	-0,5%	-0,9%	1,9%	-0,1%	0,1%	2,4%
Greece	-0,2%	-1,6%	-1,5%	-0,6%	-1,5%	-2,5%
Ireland	-0,3%	-1,6%	-2,2%	0,5%	1,2%	1,0%
Italy	-0,6%	-1,0%	2,0%	0,0%	0,7%	0,5%
Lithuania	-0,6%	-1,0%	-1,7%	0,1%	0,6%	4,5%

Luxemburg	0,0%	-0,5%	0,6%	-0,1%	0,9%	2,6%
Malta	-0,7%	-1,0%	-3,3%	-0,2%	-0,4%	0,0%
Netherlands	-0,5%	-0,6%	-1,2%	0,2%	-0,6%	0,6%
Portugal	0,0%	0,4%	1,5%	0,1%	2,4%	2,7%
Slovakia	0,1%	1,5%	0,3%	-0,2%	-0,1%	-1,1%
Slovenia	-0,2%	-0,7%	-3,1%	0,3%	0,5%	0,5%
Spain	-0,7%	-1,9%	-1,8%	0,2%	0,8%	3,0%
Bulgaria	-0,1%	-0,1%	3,5%	0,1%	0,3%	-3,2%
Croatia	-0,7%	-1,1%	-2,8%	0,2%	0,3%	-1,4%
Czech Republic	0,1%	0,5%	0,7%	0,0%	-1,0%	2,2%
Hungary	-0,7%	0,3%	1,4%	-0,3%	-0,7%	-1,2%
Poland	0,6%	1,0%	-0,5%	-0,6%	-1,5%	1,3%
Romania	0,2%	1,0%	1,7%	-0,1%	0,5%	6,2%
Sweden	0,1%	2,8%	5,4%	0,4%	1,5%	0,8%
UK	-0,1%	-0,2%	-0,1%	-0,6%	-1,1%	-2,1%
Average	**-0,2%**	**-0,5%**	**-0,1%**	**0,0%**	**0,2%**	**1,1%**

Figure 5a and 5b illustrate the pattern of the AR shift around turbulent periods identified based on the financial turbulence indicator for developed countries and emerging countries, respectively. The pattern is similar to that observed in Figure 3 and confirms the hypothesis that the AR is indeed a leading indicator of turbulence episodes. Only in the case of Spain (Figure 5a) and Slovenia (Figure 5b) the evolution of the AR shift starting 90 days before the turbulence period and ending 90 days after is more or less flat, and thus unconvincing in the role of a leading indicator. For all other countries, the AR behaves in the expected manner. It is most informative for countries like Belgium, Sweden, Portugal, Cyprus and the UK, in the developed markets group, and Hungary, the Czech Republic, and Poland in the emerging markets group.

Figure 5a

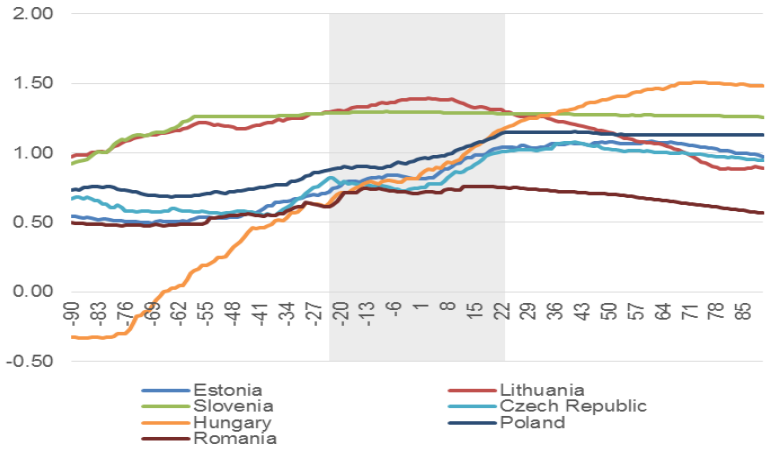
Median absorption ratio around turbulent periods of equity indices of countries with developed capital markets in the sample



Source: author's calculations

Figure 5b

Median absorption ratio around turbulent periods of equity indices of countries with emerging capital markets in the sample



Source: author's calculation

6. Conclusions

In this paper we have studied a measure of systemic risk called the absorption ratio (Kritzman et al, 2010). The absorption ratio is equal to the fraction of a set of asset's total variance explained by a finite number of eigenvectors. A high absorption ratio implies that financial markets are tightly coupled. When this phenomenon is observed, markets are also more fragile, as it becomes easier for shocks to propagate quickly and broadly. A low absorption ratio implies that markets are less compact, and thus the financial system is more resilient.

Consistent with the findings of Kritzman et al. (2010), we find that most significant stock market declines in EU countries have been preceded by spikes in the absorption ratio. We contribute to the literature on systemic risk and financial fragility by studying this indicator in the context of European capital markets. By disaggregating the data, we have shown that even in countries with less developed capital markets, the absorption ratio might have predictive power and could be used as a leading indicator of crisis episodes. We have demonstrated this ability of the AR by employing an event study of changes in the AR around turbulence episodes, as identified using a financial turbulence indicator based on the Mahalanobis distance. However, we are cautious to interpret these results in the absence of more rigorous statistical analysis.

Further research should aim at developing statistical methods for testing the AR ratio as a leading indicator, compare the performance of this indicator to other indicators of financial fragility, explore the correlations between the AR ratio and other empirical measures of systemic risk, and apply the method to different types of financial data, such as exchange rates movements, yields of government and corporate bonds, or CDS spreads.

Given its promising features, the AR ratio could be used in practice, alongside other measures of systemic risk, to improve asset portfolio performance, as well as to signal the need for policy action in the form of activation of macro-prudential instruments.

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ADAPTING ACCOUNTING AND TECHNICAL-FINANCIAL REPORTING TO NEW REQUIREMENTS IN THE INSURANCE SECTOR

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Abstract

Despite the ongoing debate on the difficulties of harmonizing national accounting systems belonging to different countries or different areas of national economies and the fact that a large part of accounting standards is still a dynamic process and continual improvement in the IASB, the adoption of IFRS comply with the new policy of the globalization of the world economy, allowing both external partners and representatives of companies involved in this process to have access to a new category of information with a higher level of quality and transparency. While traditional elements concerning the presentation of the profit or loss in accordance with the new requirements remain under IFRS recognition, the mechanism changes significantly from a marginal approach. The harmonization of technical and financial reporting formats is essential for the EU to ensure a consistent implementation of the European regulatory and supervisory framework to support EIOPA and the main purpose of which is to improve efficiency and consistency of supervision of financial institutions in Europe.

Keywords: IFRS, Solvency II, insurance company, insurance market

JEL Classification: G 220, G 320, M 410

1. Background of the accounting system and financial and technical reports for insurance companies in Romania

The current system of accounting regulations applicable to companies operating in the insurance sector in Romania was adopted by the Insurance Supervisory Commission (CSA - former insurance supervisory body) by Order number 3129, published on December 29, 2005, completed and amended by Order Number 7 of 2007.

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The Order came into effect starting on January 1, 2006, has provided - in addition to the accounting harmonization with EU directives specific to insurance - the obligation to audit the annual financial statements for insurance-reinsurance companies and insurance brokers and / or reinsurance (in depending on the achievement of certain size criteria).

In terms of technical and financial reports on all the insurance companies and / or reinsurance in Romania are required to prepare them, they were adopted by the Order No. 2, published on March 20, 2009, supplemented and amended by Order number 18 of 2011.

Order, with applicability since the end of the first quarter of 2009, established the form and content of all technical and financial reports, grouped by reporting period (annual reports, semi-annual, quarterly and monthly). Provided financial and technical reports can be classified by types of reports and according to the results they provide, as follows:

- Accounting reports:

  The financial statements and accounting reports required by accounting regulations in force.

- Reporting on the calculation of technical financial key indicators:

  Reporting calculating the solvency margin, required solvency margin and the safety fund;

  Reporting admissible assets and explanations cover gross technical reserves;

  Reporting on the determination of the liquidity.

- Reporting on detailed presentation or grouped in different categories technical data and financial information.

1.1 Evolution of the current accounting system. Expected impacts of the transition to new accounting standards - IFRS

The provisions currently applicable accounting by insurance and reinsurance market in Romania, adopted since fiscal year 2006 represents a continuation of the process of specialization in insurance and also harmonization with European Directives and international accounting standards, the process started 2001, applicable as of fiscal year 2002 through the adoption of Common Order of the Ministry of Public Finance and C.S.A. number 2328/2390 of 28 December 2001. The implementation of the new provisions of the last

mentioned order at that time represented a change of perspective the principle of accounting registration, insurance companies moving from an accounting based on records of financial flows directly related to the accounting records based on accrual accounting principles, which is why we believe that 2002 represents an important step in the evolution modality recording and reporting of financial and technical data due to basic principles of establishing new harmonized globally.

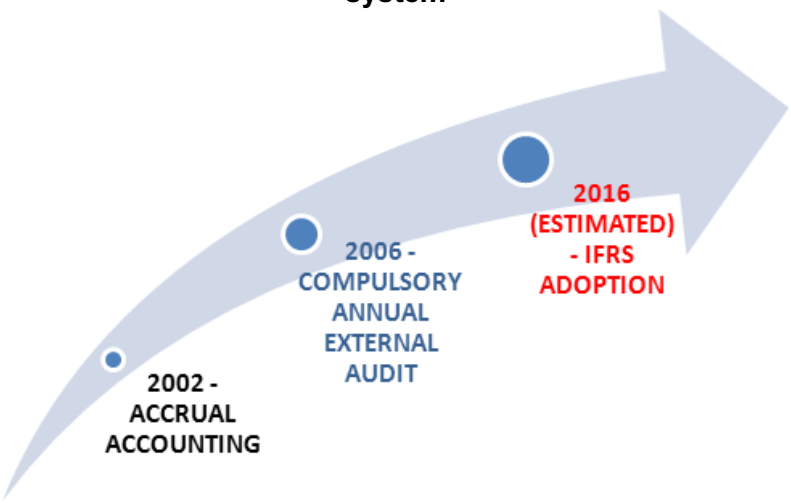
The effects recorded in the financial and technical reports due to implementation of the two acts were mainly the following aspects:

- Order 2328/2390 of 28 December 2001 (for the fiscal year 2002):
  - Changing of the bookkeeping principles, which had the effect of modifying the accounting treatment of technical data (e.g. recording gross written premium income on insurance policies underwritten value / reinsurance / coinsurance compared with past recording in the income accounting accounts for only the collected premiums related to the policies in question);
  - Implementation of a new chart of accounts and some accounting reports and annual/half-yearly financial statements specific for the insurance sector.

- Order number 3129 of December 29, 2005 (supplemented and amended by Order Number 7 of 2007):
  - harmonization of accounting regulations with European directives applicable to the insurance;
  - mandatory audit of the annual financial statements for insurance-reinsurance companies and insurance brokers and / or reinsurance (depending on achieving certain size criteria);
  - improvement of chart of accounts and accounting reports and annual/ half-yearly financial statements for the specific insurance sector.

Figure 1

Evolution of the modernization process in insurance accounting system



Continuing harmonization of accounting system and financial and technical reporting structure in insurance, C.S.A. has started since 2012 the process of applying IFRS to the insurance-reinsurance market by organizing a pilot group made up of the top 10 insurance companies depending on the insurance gross premiums written, which have gone a gradual process of transition to IFRS.

International Financial Reporting Standards (IFRSs) is a set of rules published as standard by the International Accounting Standards Board (IASB). To be applicable to entities in Romania and in other EU countries, accounting standards issued by the IASB are under review in the European Union and the official voting specially constituted committees at this level, the process by issuing ending Community regulations adopting the standards.

Relevance analysis on the type of activity consistent with the market share of these companies in the insurance market in 2011 is that most companies have a composite activity (7 companies which have a market share of 62.64% cumulative). Addressing the new financial reporting standard IFRS reduced significantly in the balance sheet of assets and liabilities only in the case of two of the companies listed: OMNIASIG VIGSA with -12.99%, respectively ASTRA SA, with -10.34%, both companies having a composite activity as a result a high degree of complexity of the business of insurance and market

share of 22,63% cumulative. For the entire group of companies analyzed was recorded a reduction in balance sheet assets and liabilities of -3.97%, a level considered low due to the negative impact of adopting new accounting standards.

After analyzing the variations registered by the companies analyzed, it can be concluded that the impact of adopting accounting standards - IFRS was significantly, registering of some insurance company balance sheet assets and liabilities declines of over 10%. Also, changes were recorded in the balance sheet structure through the re-classification of certain elements according to IFRS requirements. Adverse changes balance sheets were due mainly adopting the following standards:

- IFRS 4 - Insurance Contracts
  - *the provisions of this standard had an effect mainly on technical, meaning de-recognition of certain stocks such as catastrophe reserve and equalization reserve in case of general insurance, and claims reserve adjustment due after applying the liability adequacy test;*
  - *application of this standard has had an impact on debt adjustment reinsurance respective debts of insurance;*
  - *in the case of life insurance, IFRS 4 had an impact on the separation of insurance contracts against investment contracts in insurance contracts with investment component of unit-linked.*

- IAS 29 - Financial reporting in hyperinflationary economies - two companies were founded before 2004, considered by this standard as a limit to adjust subscribed capital and other items on equity;

- IFRS 1 - First-time Adoption of IFRS - IFRS 1 is mandatory standard applied by all companies that adopt IFRS, setting rules for evaluation, and presentation of information following the adoption of IFRS;

- IAS 1 - Presentation of Financial Statements - IAS 1 is the mandatory standard applied by all companies that present information under IFRS, establishing rules for the presentation of financial statements, and the structure and composition;

- IAS 39 - Financial Instruments: Recognition and Measurement
  - *This standard has had a major impact on investments and financial instruments held, meaning their recognition and measurement at fair value;*
  - *also, the application of this standard resulted in a change of the presentation structural availability and short term investments balances of two companies, meaning those amounts re-classification of the investments held in the position representing the current availability of cash and current accounts are the amounts placed in a term up to 90 days.*

Despite the ongoing debate on the difficulties of harmonizing national accounting systems from different countries or areas belonging to different national economies and the fact that much of accounting standards is still a dynamic and continuous process of improvement in the IASB the adoption of IFRS are included in the new policy of the globalization of the world economy, allowing both external partners (customers, investors and supervisors) and representatives of companies involved in this process (shareholders, managers, analysts) have access to a new category of information with a higher level of quality and transparency.

In Romania, the project on the adoption of IFRS for insurance-reinsurance market has emerged as a mandatory measure prior and future crossings and because of a new solvency regime, but also as a tool for enhanced surveillance of FSA. Also, the adoption of new standards - involving employment in a transparent and harmonized information in the financial reports financial reporting - provides support for analyzing and interpreting modern technique for major internal and external user groups mentioned above. On the other hand, the adoption of IFRS requires defining policies and universal accounting principles, with a minimum degree of detail of the information presented, and a growing involvement and responsibilities of the managers of the respective companies.

The main standards concerning insurance and reinsurance market, namely:

- *IFRS 4 - Insurance Contracts,*
- *IFRS 7 - Financial Instruments: Disclosures,*

- *IAS 32 - Financial Instruments: Presentation,*
- *IAS 39 - Financial Instruments: Recognition and Measurement,*

aim to increase transparency in order charging, insurance and reinsurance contracts, the profitability of different types of insurance and reinsurance practiced, as well as risk management and investments. Following the adoption of these new standards will redefine competition rules followed by insurance companies because insurers will report under IFRS will be able to understand their financial performance and efficiently manage their affairs in accordance with the revised reporting in a more transparent, hovering eventually in an advantageous position compared to other companies on the market.

In order to achieve optimal framework for adopting IFRS, insurers must take into account the following aspects:

- *Applying IFRS increases operational risk of the companies involved due to the high degree of technical complexity and due to the involvement of various staff categories (not involved in the past financial reporting system), such as actuaries, specialists in risk assessment and investment specialist not least, the company management;*
- *Applying IFRS involves increasing volume of data and information analyzed and also the time required for interpretation and analysis of the results obtained, this having the effect of increasing the involvement of specialized staff; therefore, it requires that a qualified and sufficient in order to cover the minimum requirements of the standard;*
- *Updating and possibly changing systems and databases to ensure sufficient volume and history in order to ensure minimum requirements for analysis and reporting provided; in this regard, the adoption of IFRS may result in the necessity of completing the initial stage of investment in the modernization and harmonization of systems.*

1.2 The influence of the new solvency regime Solvency II under the technical and financial reports

While traditional elements concerning the presentation of the profit or loss in accordance with the new requirements remain IFRS, recognition mechanism changes significantly from a marginal approach. Assigning this theme under Solvency II is similar but profit

under IFRS recognition principle (profit being recognized with obligations under the policies in force) is different from the Solvency II recognition principle surplus (at a notional value), this key-difference requiring adequate controls and processes and modeling recognized under IFRS additional profit.

As a result, a number of measures will be undertaken in order to adopt the new standard for success of the new IFRS and Solvency II regime, due to the fact that the data requirements for IFRS and Solvency II overlap (however IFRS enter data that were not considered in Solvency II data model and requires that similar parameters to be calibrated differently):

- Incentives and compensation will be recalibrated its Solvency II frameworks and IFRS, as well as strategy and the entity's governing by broader structures;
- Educate management and staff on how their insurer company have success under both Solvency II and IFRS, will require significant investments which will allow the training of complying with new capital assessment methods and profit;
- More work is required to present the necessary information. Companies recognize the need to improve the information presented, and considering the progress in risk management and capital, along with regulatory initiatives such as Solvency II, is likely to result in greater transparency and added value for users;
- Parallel evolution of IFRS and Solvency II framework, improving presentation will determine the risk management practices and risk margins, thus bringing consistency in risk management looked from the perspective of capital adequacy;
- It is recommended that, when a company is considering implementing an IT solution either for Solvency II, either for IFRS, to be considered together.

Solvency II Directive (Directive 2009/138 / EC) was adopted in November 2009, and amended by Directive 2014/51 / EU of the European Parliament and of the Council of 16 April 2014 (the 'Directive' Omnibus II "). On 10 October 2014 the European Commission (EC) adopted the Commission Delegated Regulation (EU) 2015/35), which contains detailed rules for Solvency II, which was published in the Official Journal on 17 January 2015. In February

2015 it published the first set EIOPA Solvency II guidelines, in all official EU languages.

In March 2015 the European Commission adopted the first set of implementing regulations of Solvency II in connection with establishing implementing technical standards regarding approval procedures for supervision:

- parameters specific to insurance companies;
- auxiliary own funds;
- necessary adjustments;
- vehicles with special destination;
- internal models;
- joint decision of their internal models group.

Managing the implementation of the new solvency regime at European level is achieved through EIOPA - European Insurance and Occupational Pensions Authority, the body that is part of a European System of Financial Supervisors, comprising three European Supervisory Authorities for the banking, securities sector securities and insurance and occupational pensions sector, and the European Systemic Risk Board.

The harmonization of technical and financial reporting formats at EU level is essential to ensure a consistent implementation of the European regulatory and supervisory framework to support EIOPA and the main purpose of which is to improve the efficiency and consistency of supervision of financial institutions in Europe.

Solvency II has created the need for all insurance companies and supervisory authorities in Europe to adapt reporting processes. XBRL is mandatory technical format to be used to report from the national authorities by EIOPA (secondary reporting) and also adaptations of the format for reporting from insurance companies by national authorities (first level reporting).

The main goal of this project is to create a basic tool simply oriented insurance companies of various sizes to create, edit, correct, complete and valid economic data and help insurance companies to implement the new solvency regime.

In conclusion, considering the adoption of A.S.F. Decision No. 47/2013 on the implementation of preparatory guidelines for the implementation of Solvency II supervisory regime and also the

procedure for identifying the companies covered by that decision, influence of the implementation of the new solvency regime Solvency II on financial and technical reports lead to a broadening of the spectrum information, extending requests data and information on the following areas:

- Assets and liabilities by currency;
- Derivatives;
- Solvency capital requirement depending on risks: market, counterparty, operational, catastrophe.

2. Solutions and proposals for the modernization of accounting and technical-financial reporting in the insurance sector

As the types of insurance offered and the range of risks covered by insurance companies experienced a sustained growth in recent decades due to increased competition in the insurance and reinsurance sector, financial sector development, and the additional demands investors and executive management of insurance companies were required identification solutions extend the ways of accounting records.

A first step was the transition to accrual accounting, presently followed by the adoption of international accounting standards. Those two steps imposed in the first instance the establishment of accounting principles that can be transposed and implemented in the accounting treatment. Another influence was the definition and reconsideration of both technical and operational risks.

In terms of technical and financial reports, it requires firstly to clarify the reporting system of insurance companies. Due to globalization a growing number of insurance companies are owned by holding companies or other insurance companies (or financial and banking groups) in or from other countries, which is why these companies are obliged to implement a system of internal reporting which is often not adapted to the local reality or specific activity. Moreover, the intensification of monitoring financial risks (due to the negative effects of the recent financial crisis) and successive tests due next implementation of the new solvency regime and new accounting standards resulted in the creation and implementation of a parallel reporting system, which includes also the concurrent reports from the financial and fiscal authorities. Finally, should be considered also the technical reports to the supervisory authority and operational reporting to executive management of insurance companies.

2.1 Solutions for extension of the accrual basis of existing data and information from the insurance companies

The transition to accrual accounting as of fiscal year 2002 accounted for insurance companies a very important step, both in terms of accounting treatment and recognition in terms of technical complexity by implementing a specific chart of accounts tailored to insurance market. Process improvement and specialization in insurance accounting system continued through the adoption of new provisions starting with the financial year of 2006.

From a technical standpoint, the new accounting provisions permitted a clear reflection of data and information available to the companies, while ensuring a continuous and efficient reporting method. Such accounts have been created for all types of underwriting: insurance, coinsurance, reinsurance, ensuring calibration of recording technical data as follows:

- Operating income accounts:

- Revenue from gross premiums written for direct insurance;
- Revenue from gross premiums related to reinsurance acceptances;
- Gross written premiums canceled (-);
- Gross written premiums ceded (-);
- Income from reinsurance commissions;
- Claims - reinsurer part;
- Income from recoveries.

- Operating expenses accounts:

- Claims expenses;
- Reinsurance commissions expenses;
- Commissions expenses (related to direct insurance);
- Change in deferred acquisition costs.

- Technical reserves expenses:

- Technical reserves expenses for direct insurance;
- Technical reserves expenses relating to reinsurance acceptation;
- Technical reserves expenses for direct insurance – reinsurance part (+);
- Technical reserves expenses relating to reinsurance acceptation – reinsurance part (+).

Although current accounting provisions provide a framework for registration and reflection in accounting for insurance companies, future adoption of new accounting standards IFRS and specifically to IFRS 4 - Insurance Contracts - standard dedicated to the insurance industry, impose a need for improvements and additions to the current accounting system, due mainly to the following chapters:

- reinsurance;
- claims management activity - litigation and recovery;
- receivables management activities relating to insurance policies - provisions issued.

In this respect, it is necessary for solutions to be implemented linked with the recommendations mentioned below:

- on reinsurance accounting, treatment should be extended in recognizing all the influences due reinsurance policy, in terms of new accounts technical data sheets for the following (examples):
- Deferred reinsurance commission (-) / (+);
- Recoveries – reinsurers part (-).
- Regarding the activity of management of claims - litigation and recoveries - clarification of issues concerning the obligation of registration in the amounts of claims reserves recorded litigation for damages and also establish a system to offset setbacks between insurance companies;
- With respect to receivables management activities relating to insurance policies - provisions recognized - is it compulsory for insurance companies to record monthly provisions related to insurance policies for due premiums which were not collected according to the insurance conditions.

2.2 Proposals to modernize and streamline the technical and financial reporting in the insurance sector

The current financial and technical reporting framework for insurance companies has been transposed by adopting Order no. 2/2009 to implement the Norms regarding the form and content of the financial and technical reports for insurance and / or reinsurance companies and consisted in the setting of mandatory formats for technical and financial reports in accordance with specific reporting period: annual, semi-annual, quarterly and monthly reports.

The reports mentioned were implemented in order to improve market supervision insurance and reinsurance, however, it is noted that in terms of main financial reports, namely: balance sheet, profit or loss, , are binding only reported in the annual respectively half-yearly

reports, the reason being the influence of fiscal and financial reporting methods, system regulated by the Ministry of Finance. Moreover, in the technical reports are provided quarterly and monthly reporting significant patterns (examples: reporting transactions performed, reporting obligations undertaken, reporting admissible assets and explanations on gross technical reserves coverage, reporting on determining liquidity ratio) that it can't be verified and calibrate with the previous financial reports.

Another important aspect is the adoption in the near future of the new solvency regime Solvency II and also the new international financial reporting standards IFRS, changes that will influence policy surveillance and reporting in the insurance field, the ultimate goal being to provide superior information in terms of quality of end-users: existing and potential customers supervisors, senior executives of insurance / reinsurance, prospective investors.

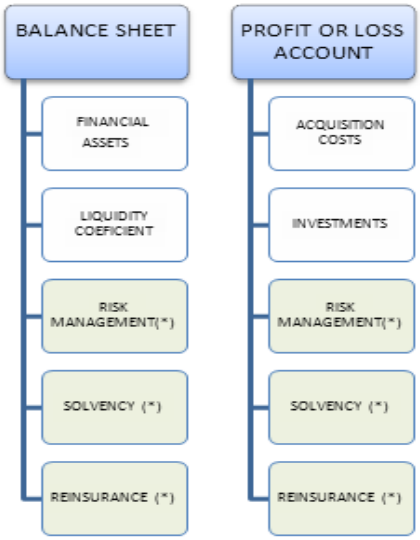
In this respect, it became necessary the creation of a new financial reporting system which respects the financial and technical data calibration principle. The financial and technical reports required to be issued by insurance companies must constitute a whole, starting from a minimum package of technical and financial reporting month. This could have the following structure (technical and financial reports whose data and information are correlated):

- Balance sheet;
- Profit or loss (the data will be presented in detail on insurance classes);
- Reporting on financial assets;
- Reporting on acquisition costs;
- Reporting on investments;
- Reporting on the determination of the liquidity;
- Reporting on risk management;
- Reporting on solvency margin;
- Reporting on reinsurance.

The manner of linking technical and financial data is presented below:

Figure 2

Structure of the monthly package of proposed technical and financial reports (* *joint connections*)



The proposed reporting structure must contain a validation file contained links between reporting and also as the end result a summary of the main financial and technical indicators for insurance-reinsurance activity.

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SIMULATING AN ARTIFICIAL STOCK MARKET WITH GENETIC PROGRAMMING INDUCED TRADING STRATEGIES

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Abstract

The artificial stock market which is the subject of the hereto paper is simulated in Altreva Adaptive Modeler multi-agent simulation software application. The simulation model incorporates 2,000 heterogeneous agents which trade amongst each other on an artificial stock market which uses a call auction trading mechanism. Within the evolutionary agent-based model, the population of agents is continuously adapting and evolving by using genetic programming in order to obtain new agents with better trading strategies generated from combining the trading strategies of the best performing agents and thus replacing the agents which have the worst performing trading strategies.

Keywords: agent-based modeling, heterogeneous agents, technical trading.

JEL Classification: C63, G17

1. Introduction

The aim of the hereto research is to describe an adaptive agent-based model of the stock market, incorporating 2,000 heterogeneous agents which trade within an artificial stock market. In order to achieve our research aim, we use the Adaptive Modeler [1] software to simulate an adaptive agent-based model for artificial stock market generation. Thus, heterogeneous agents trade a stock floated on the stock exchange market, placing orders depending on their budget constraints and trading rules, where the artificial market is simulated as a call auction market.

The population of agents is constantly adapting to the new market conditions by using evolutionary computing, namely the Strongly Typed Genetic Programming [2]. This breeding process generates new agents with better trading strategies obtained from

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recombining the trading strategies of the best performing agents and thus replacing the agents which have the worst performing trading strategies. This technique allows for adaptive, evolving and self-learning market modelling and forecasting solutions.

To explore and understand the complexity of the financial markets and trading behavior, models using agent-based modeling techniques have been successfully implemented, offering explanation for observed stylized facts and being able to reproduce many of them [3], [4]. Arthur et al. [5] from Santa Fe Institute, Ca., USA, developed an artificial stock market which allowed for testing of agent-based models with heterogeneous agents. Rust [6] and Phelps et al. [7] have used in their experiments heterogeneous agents which change their strategies during the learning process, as follows: the unprofitable strategies are being replaced with the more profitable ones, thus developing adaptive models which use genetic algorithms to evolve. Walia [8] has studied the development of the agent-based models which use genetic programming, allowing for more flexibility and effectiveness in finding optimal solutions, programs being encoded as tree structures, thus crossover and mutation operators being applied easier. The later is similar with the learning process used in the hereto paper.

An agent-based model represents a computational model for simulating the actions and interactions among agents in a multi-agent system in order to analyze the effects on a complex system as a whole, being a powerful tool in the understanding of markets and trading behavior. An agent-based model of a stock market consists of a population of agents (representing investors) and a price discovery and clearing mechanism (representing an artificial stock market). The complex dynamics of these heterogeneous investors and the resulting price formation process require a simulation model of a multi-agent system and an artificial market.

The evolutionary agent-based model referred to in this paper is simulated in Adaptive Modeler software, which supports up to 2,000 agents and 20,000 simulation periods for each epoch of simulations. The agents are autonomous and heterogeneous entities representing the traders of the stock market, each having their own *wealth* and their own trading strategy called the *genome*.

The agent-based model is simulated under different computational techniques compared to other scientific papers in this field, due to the fact that in Strongly Typed Genetic Programming (STGP) the process of estimating the agents' fitness function does

not include re-execution of the trading rules based on historical data, therefore there is no over-fitting. This is possible due to the fact that the model evolves in a time-incremental way, and it does not optimize on historical data, thus avoiding over-fitting of the data which seems to represent one of the biggest forecasting pitfalls. This model uses a high number of artificial agents, namely 2,000 agents and 2,000 continuously adapting trading rules, which increases model stability and reduces sensitivity to random factors. Trading signals given by the model are based on the interaction of all artificial agents, and not just on a single trading rule. The agent-based model is dynamic, constantly evolving and adapting to market conditions.

The remainder of this paper is structured as follows. Section 2 presents the artificial stock market trading mechanism, Section 3 describes the cycle of the evolutionary agent-based model. Section 4 the specifications of the adaptive agent-based model used in the simulations, the paper ending with the conclusions and directions for future work.

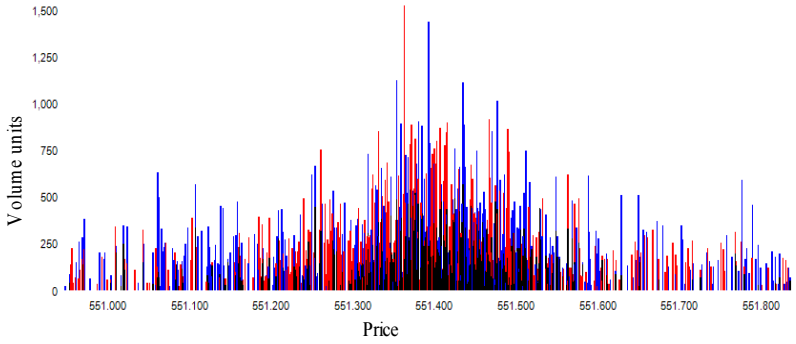
2. Artificial stock market trading mechanism

The artificial stock market trading mechanism is based on a call auction which represents an order driven facility which batches multiple limit orders together for simultaneous execution in a multilateral trade, at a single clearing price, at a predetermined point in time.

A limit order is a price-quantity pair which expresses an offer to buy or sell a specific quantity at a specific price, while a market order specifies a quantity but not a price, limit order price being the maximum allowable bid or minimum allowable ask which allows the order to be executed. A single trader may submit a single order per batch interval, which are not visible to other agents during the batch interval, the auction being a sealed bid.

Figure 1

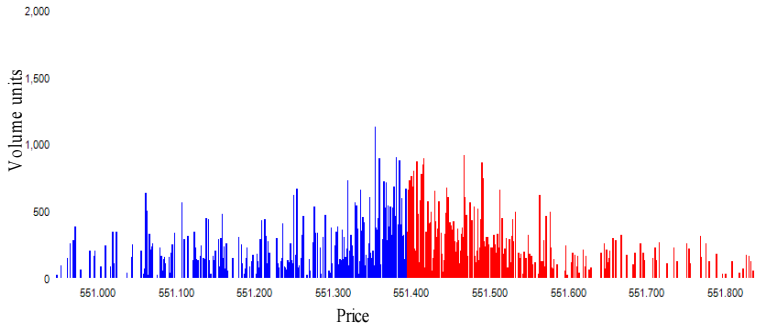
Order book example from the agent-based model simulation



***Source**: Agent-based model simulations with Adaptive Modeler software application*
Note: Blue bars represent bid volume orders, red bars represent ask volume orders, black bars represent bid and ask volume orders at equal prices, before market clearing.

Figure 2

Order book example from the agent-based model simulation



Source*: Agent-based model simulations with Adaptive Modeler software application*
Note: Blue bars represent bid volume from unexecuted orders, red bars represent ask volume from unexecuted orders, after market clearing.

The trading mechanism used by the Adaptive Modeler software application to simulate the artificial stock market is set as call auctions mainly because many stock markets use this mechanism. In the call auction markets, agents introduce bid or ask orders, each order consisting of a price and quantity. The bids and asks orders received are put in the order book and an attempt is made to match them. The price of the trades arranged must lie in the bid-ask spread (interval between the selling price and buying price).

3. The cycle of the evolutionary agent-based model

The genetic programming evolutionary cycle of each simulation period can be summarized in the following points:

- **Receive new quote bar**.
- **Agents evaluate trading rules and place orders**: Agents receive access to historical prices and evaluate the evolution of prices according to the technical analysis generated by their trading rules found in the genomes, resulting in a desired position as a percentage of wealth limited by the budget constraints, and a limit price. Agents are two-way traders during the simulations, meaning that they are allowed to both sell and buy during multiple simulation periods, and they are one-way traders during a single simulation period (in this case a day) corresponding to an auction, as they are able to submit only one order per auction, either buy or sell. The position is generated in a random manner, while the limit price is generated after a technical analysis has been performed, according to the genome structure which represents trading functions.
- **Artificial stock market clearing and forecast generation**: The artificial stock market determines the clearing price in the call auction, which is a discrete time double-sided auction mechanism in which the artificial stock market collects all bids (buying orders) and asks (selling orders) submitted by the agents and then clears the market at a price where the supply quantity equals the demanded quantity. The clearing price is the price for which the highest trading volume from limit orders can be matched, thus all agents establish their final positions and cash at the same time. In case the same highest trading volume can be matched at multiple prices, then the clearing price will be the average of the lowest and the highest of those prices. The artificial stock market executes all executable orders and forecasts the price for the next simulation period. The forecasted price is set equal to the clearing price.

- **Breeding**: During the breeding process, new agents are created from best performing agents in order to replace the worst performing agents, creating new genomes by recombining the parent genomes through a crossover operation, and creating unique genomes by mutating a part of the genome. The breeding process repeats at each bar, with the condition that the agents must have a minimum breeding age of 80 simulation periods, in order to be able to assess the agents' performance.

In order to obtain random seed, the Adaptive Modeler software uses the Mersenne Twister algorithm [9] to generate pseudo random number sequences for the initial creation of trading rules or genomes and for the crossover and mutation operators of the breeding process.

The genomes attached to the each agent uses a tree composed of genes which generates the trading strategies. The initial node in the genetic program tree combines the position desired in the security generated randomly, and the limit price value generated by a collection of functions working as a technical analysis on the historical prices, into a buy or a sell order advice. The desired position value ranges between -100% (short position, or selling position) and 100% (long position, or buying position) which is randomly generated from a uniform distribution. The limit price value is generated by a collection of functions which uses simple technical indicator initially generated in a random manner from the list of functions selected to be used in the model, which develop during the breeding process, in order to generate the limit price for the buy or sell order.

The buy or sell order is introduced in the market after comparing the desired position with the agent's current position and calculating the number of shares that need to be bought or sold, taking also in consideration the available cash. The trading rules of the model use historical price data as input from the artificial stock market, and return an advice consisting of a desired position, as a percentage of wealth, and an order limit price for buying or selling the security. Through evolution the trading rules are set to use the input data and functions (trading strategies) that have the most predictive value.

The agents' trading rules development is implemented in the software by using a special adaptive form of the Strongly Typed Genetic Programming (STGP) approach, and use the input data and functions that have the most predictive value in order for the agents with poor performance to be replaced by new agents whose trading

rules are created by recombining and mutating the trading rules of the agents with good performance. In order to do this, a dynamic fitness function is used to evaluate the performance of the agents, and only the most recent simulation periods of the epoch are taken in consideration for computing the fitness function. As regards to the breeding process at each simulation period, the adaptive form of the STGP approach only takes in consideration a percentage of 5% of the total population of agents.

The STGP was introduced by Montana (2002) [2], with the scope of improving the genetic programming technique by introducing data types constraints for all the procedures, functions and variables, thus decreasing the search time and improving the generalization performance of the solution found. Therefore, the genomes (programs) represent the agents' trading rules and they contain genes (functions), thus agents trade the security on the artificial stock market based on their technical analysis of the real market historical price data.

During the breeding process, new offspring agents are created from some of the best performing agents to replace some of the worst performing agents. In order to achieve this, at every bar, agents with the highest value of the Fitness Return function are selected as parents, and the genomes (trading rules) of pairs of these parents are then recombined through genetic crossover to create new genomes that are given to new offspring agents. These new agents replace agents with the lowest value of the Fitness Return function. The fitness function is a metric of the agent's investment return over a certain period, therefore the Fitness Return function is computed as the wealth return over the last 80 analyzed quotes and represents the selection criterion for breeding.

The agents are endowed with wealth and a trading strategy which is called the genome, which is randomly created by taking in account the selected genes (which represent functions) using genetic programming. Broker fees are fixed at 10 points of value for each transaction. There is no market maker. All the parameters of the model are described in Table 1.

Table 1

General settings of the models. Market and agents' parameters configuration in the simulations

Parameter Type	Parameter Name	Parameter Value
Market Parameters	No. of simulation periods	Max 20,000
	No. of agents	2,000
	Minimum price increment	0.01
	Average bid/ask spread	0.01%
	Fixed Broker fee	10
Agent Parameters	Wealth Distribution	100,000 initial wealth for each agent
	Min. position unit	5%
	Max. genome size	1,000
	Max. genome depth	20
	Min. initial genome depth	2
	Max. initial genome depth	5
	Genes	CurPos, RndPos, LevUnit, Rmarket, Cash, Bar, PndPos, IsMon, IsTue, IsWed, IsThu, IsFri, close, bid, ask, average, min, max, >, change, +, dir, isupbar, upbars, pos, lim, Advice, and, or, not, if
	Breeding Cycle Length	1 simulation period
	Minimum breeding age	80 simulation periods
	Initial selection: randomly select	100% of agents of minimum breeding age or older
	Parent selection	5% agents of initial selection will breed
	Mutation probability	10% per offspring

4. Conclusions

The hereto paper brings to light the importance of the agent-based modeling of multi-agent systems, used to model the stock market. The results of the academic studies of artificial stock markets using genetic programming are still in contradiction, mainly due to the variety of models which make it hard to classify and compare. Their complexity, lack of transparency and high number of degrees of freedom make understanding and further development very hard.

Due to the high diversity of financial data, the fitting of a general model for all the data has become an impossible mission, but adaptive models such as the one described in this paper represent a step further when it comes to stock market simulations techniques, stressing the importance of using an evolutionary model, a model that evolves and adapts to the new market conditions.

The main improvements brought by this type of models are the following: the fitness function is computed as the actual return of the artificial agent after trading in the artificial stock market; there is no over-fitting the historical data during the learning process due to the fact that the model evolves in a time-incremental way, and it does not optimize on historical data. This model uses a high number of artificial agents, namely 2,000 agents and 2,000 continuously adapting trading rules, which increases model stability and reduces sensitivity to random factors. Trading signals given by the model are based on the interaction of all artificial agents, and not just on a single trading rule. The agent-based model is dynamic, constantly evolving and adapting to market conditions.

Further research will focus on simulations of the model and testing whether trading strategies developed in the model could be used for hedging purposes.

Acknowledgement

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THE SHORT-RUN PERFORMANCE OF THE IPO SHARES OF NUCLEARELECTRICA AND ROMGAZ. AN EMPIRICAL ANALYSIS

Ion MICU, PhD Candidate [*]

Abstract

This paper is proposing an empirical analysis of the short-run performance of the shares subsequent to the two IPO's in the Romanian capital market in 2013, specifically the IPO of S.N. NUCLEARELECTRICA S.A. and of S.N.G.N. ROMGAZ S.A. It will be analyze if these two IPO's, the most important ones in Romania in the last 5 years, present the same general characteristics of underpricing that have been determined and documented by researchers like Jay R. Ritter or Kristian Rydqvist. This research will be realized by applying the models proposed in their works and by making an empirical determination of the short-run performance of the two stocks mentioned relative to the evolution of the market and to the initial price, observed until December 2014.

Keywords: IPO, short-term performance, equity, stocks, BVB

JEL Classification: G12

1. Introduction

An initial public offer is the act of a selling a security for the first time on reglemented capital market, for creating liquidity. One of the best-known phenomenon pertaining to IPO's is the high frequency of substantial initial returns (the difference between the price of the IPO and the market price set on the first day of trading) for the investors. This phenomenon has been documented by numerous studies and analysis that have determined an asymmetric distribution of initial returns on investments. For example in the US the medium initial return for IPO's is about 15% (Ritter, 1998).

The phenomenon mentioned, which is specific to IPO's (initial public offerings), is called „underpricing" and it is particular to each capital market, but the degree of underpricing differs from country to country. Also a tendency has been identified for securities listed

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through an IPO to have a lower performance than the average of the stock market, in the first 5 years of trading. This article will focus on the shares of S.N. NuclearElectrica S.A. and S.N.G.N. Romgaz S.A listed on the Bucharest Stock Exchange by initial public offer in 2013 and on a subsequent analysis of the underpricing and short term performance specific to these shares, so it can be verified if the described phenomenon specific to IPO's are also applicable to the Romanian capital market.

The Romanian stock exchange has been characterized in the last years by a low liquidity and in 2013, when the two IPO's that are the subject of analysis, the first ones on the Romanian capital market in the last five years (that were successful), the investors considered this a sign for a new era of prosperity. That is why it was considered that this study of the performance managed by these two stocks launched in 2013 can verify if the expectations of the investors ring true and if the two IPO's managed to reignite the Romanian Stock Exchange.

2. Underpricing

One of the best-known characteristics of initial public offerings is the "underpricing", which is pricing the stock in the initial public offering below the real market value of the newly issued stock. Thus, when trading starts of said stock, the price will increase significantly in comparison with the rest of the capital market, which produces high returns for the investors. This is just temporary because the laws of offer and demand will drive the price to its intrinsic value.

Regarding underpricing, the phenomenon that influences the short term performance of initial public offerings, which will be analyzed in this article for the stocks issued by NuclearElectrica and Romgaz, it's generally considered that it is generated to alleviate the concerns of the investors regarding liquidity and the concerns of the issuers about the attraction that the new stocks will generate for investors. Basically investors are concerned that they will lose money with the new stocks and the issuers are concerned that nobody will buy their new stocks. But this is just one very general theory that doesn't account for all the variables. What is certain is that the process of going public is very stressful for the entrepreneurs and an unknown stock can make investors very wary.

Economists have proposed many hypotheses and models for the appearance and determination of underpricing, that aren't necessarily mutually exclusive. What is certain is that certain theories

are better suited for certain IPO's. The most widely accept theories for underpricing are:

a) "*Winner's curse*" – this is one of the best-known hypothesis for underpricing and it was proposed by Rock (1986) and it's sustained by analyses like the ones of Koh and Walter (1989). The idea is that if the demand for an IPO is substantial and it exceeds the quantity offered (oversubscribed), then rationing will occur. In this case the investors that are at an informational disadvantage from the others (being unable to correctly measure the value of the new stock and subsequently decide on the value of their investment) can be affected by the "winner's curse" in case of rationing: being allocated o small part of the attractive stocks and/or a lot of unattractive ones. Although rationing by itself don't lead to underpricing, if informed investors try to buy as much attractive stock as possible in an IPO, the lesser informed investors will get a smaller number of stock. This is why uninformed investors will only make an offer to buy if on average the initial public offerings are underpriced enough for them to be compensated in case of an unequal allocation.

b) Market feedback – when the book building method is used to form the price of an initial public offering, investment banks use underpricing to determine the investors in giving accurate information in the pre-sale period for setting the price. Furthermore, to determine a fair evaluation from the investors of a certain IPO, the investment banker needs to underprice more the issues for which favorable information has been revealed than the ones with unfavorable information. This aspect leads to the presumption that there will be a change in in the offer price in the final prospectus, from the preliminary one. Thus, an IPO for which the price was revised up (raised) will be more under priced than one for which the price was revised down (lowered). This hypothesis comes form Rock's (1986) analysis and has been tested by Van Bommel and Vermaelen (2003).

c) The bandwagon effect – this hypothesis, proposed by Welch (1992) and Ritter (1998), considers that the market for an IPO can be characterized by a bandwagon effect. This means that if investors pay attention not only to their own personal information, but also to the actions of other investors, if they are buying or not, their decision can be influenced, thus creating a bandwagon effect. If some investors won't buy the stock from the IPO they can influence others to do the same. This is why an issuer, to counter such an effect, can underprice it's own issue to try to recreate the same bandwagon

effect in reverse and determine other investors to also buy they're stock, regardless of the information they might have.

d) The hypothesis of the investment banker's monopsony – this theory refers to the possibility that investment bankers or brokers, that are charged with setting the initial price, can use their superior knowledge of the market to underprice the IPO's they manage so that they can lower their marketing costs/effort and also they can indebt the buyers, thus creating a close business relation with them. According to the analyses of Ritter (1998 and 2011) and of Fishe and Boehmer (2001), while there is some partial truth to this theory, especially in the case of less sophisticated issuers, even when an investment firm is listed on the stock market through an IPO, it is underpriced to a comparative level to the rest of the market. Even so, investment bankers and brokers that run IPO's say that the underpricing phenomenon is normal and is not artificially induced.

e) The hypothesis of lawsuit avoidance – Tinic (1988) and Hughes and Thakor (1992) have considered that underpricing can represent a method, although a costly one, to reduce the frequency and severity of lawsuits that can be generated by an IPO, because through underpricing a loss on the stock market is less likely and the investors are tempted to ignore any potential errors of the issuers or the investment bank, because of the profits generated. Ritter (1998) suggests that this hypothesis is derived from the regulations of the U.S. stock market, Securities Act from (1933), which states that all the participants to an initial public offering that sign the prospectus are responsible for that issue

f) The "signaling" theory – this hypothesis and the "winner's curse" one have the most followers for explaining the underpricing phenomenon, citing the works of Garfinkel (1993), Welch (1989) and Allen and Faulhaber (1989). According to the models they proposed, underpriced initial public offerings create for themselves a good reputation in the eyes of the investors, which permits those issuers and their affiliated persons to sell those stocks in the future for a better price than normal. This signaling theory has also been formalized in signaling models, which consider that the issuers have knowledge pertaining to the issue, if it has a small or large value and they can follow a dynamic investment strategy through which the initial public offering will be followed by a secondary public offering that will capitalize on the reputation created. Even so, a number of empirical studies have not been able to identify a relation between the initial return of an IPO and the price of

subsequent public offerings, raising some question marks regarding this "signaling" theory.

g) The hypothesis of ownership dispersion – issuers could deliberately underprice their IPO, according to the analysis of Booth and Chua (1996), to generate en excess of demand and oversubscription that will lead to rationing of the stock and creating a large number of minority shareholders. This dispersion of ownership will increase liquidity of the issue and it will make it difficult for new shareholders to gather and question the management decisions.

These are, according to Ritter (1998), the main accepted theories for the underpricing of initial public offerings. Although the majority can be criticized and arguments against them can be made, they all have an element of truth to them. The underpricing phenomenon persists for a ling time on the international capital markets and there are no signs that it will soon be over.

Also, in the specialized literature there has also been identified a characteristic of initial public offerings of having a lower return on investment, comparatively to the rest of the stock market. Ritter (1998) discovered, based on the analysis of the performance in the first 5 years of trading of 5.281 initial public offerings in the U.S.A. in the 1970-1993 time frames, that these IPO's have a growth[1] that is 20% lower than that of other comparative stock on market. This phenomenon is more pronounced for firms that have gone public in years of high liquidity on the market and for "young" firms.

There have been a lot of analyses based on the phenomenon specific to initial public offerings that confirmed their presence even in the case o IPO's on different international capital markets, but with different degrees of underpricing. This study will verify the existence of underpricing for the issues of Romgaz and NuclearElectrica, listed through initial public offerings, and also their short-term performance, if in the first year of trading they had a tendency to grow that was below the market average.

3. Methodology

To do an analysis of the short term performance of stocks issued by S.N. NuclearElectrica S.A. (symbol B.V.B. - SNN) and S.N.G.N. Romgaz S.A (symbol B.V.B. - SNG) first the underpricing of the two stocks has been determined using a model proposed by Saunders/Lim (1996) and Lee/Taylor/Walter (1996), which takes into

[1] *For this analysis, the closing price of the first trade day has been considered and not the price established in the initial public offering.*

account the closing price of the first trading day and the price of the initial public offer.

$$UN_i = \frac{(PI_i - PO_i)}{PO_i} \times 100$$

- UN = underpricing
- PI_i = closing price of the first trading day
- PO_i = price of the initial public offer

It can be observed that for the stocks symbol SNG there has been an underpricing of **15%** and for SNN of **3%**, which is 5 times lower. If we also take into consideration the underpricing of the initial public offer of Electrica S.A. (the only other successful IPO in Romania in the last 5 years), which was in 2014 with a **2.3%** underpricing, we have an average underpricing specific to the capital market of Romania of **6.8%.** Considering the results of the analysis done by Loughran, Ritter and Rydqvist (1994), this value is comparable to the underpricing specific to Austria (6.5%), Denmark (7.7%) and Holland (7.2%).

The significant difference between the underpricing of the two initial public offers that are analyzed makes it extremely difficult to approximate an average underpricing specific to the capital market of Romania. However, such an average can't be determined with a high degree of confidence because of the very reduced sampling data for a statistical analysis (only four IPO's in the last five years and only 3 of those were successful), which can't determine findings of statistical relevance that can be considered representative.

To do an empirical analysis of the short term performance of the two stocks (SNN and SNG) data has been collected, regarding the evolution of their price, into a database of their closing price at the end of the month, for the analyzed period. This information was obtained from the stock markets monthly publications. This model is based on the official evaluation method of a stock that is listed on a regulated market, according to article 113 paragraph 1 point 1 of Regulation no. 9/2014 of the Romanian Financial Supervisory Authority (ASF), which states that stocks are assessed at their closing price on their main market segment, for the day in question. To eliminate any abnormal variations, which could be generated by various current situations, only the closing price at the end of the month was considered, because for the current analysis only the general evolution of the price is necessary for the two stocks and not all the price variances in the analyzed period.

To be able to make a comparison with the general evolution of the capital market in Romania, the BET index of the Bucharest Stock Exchange has been taken into consideration, which is the reference index for the capital market in Romania and is comprised of he top 10 most liquid companies form the principal market of the Bucharest Stock Exchange (excluding the five listed financial investment funds – SIF). This is a price index weighted with the capitalization of the free float, the main criteria for selection of the companies included in this index being their liquidity (the two analyzed companies, Romgaz and NuclearElectrica, are a part of this index.

Figure 1

SNG stock performance

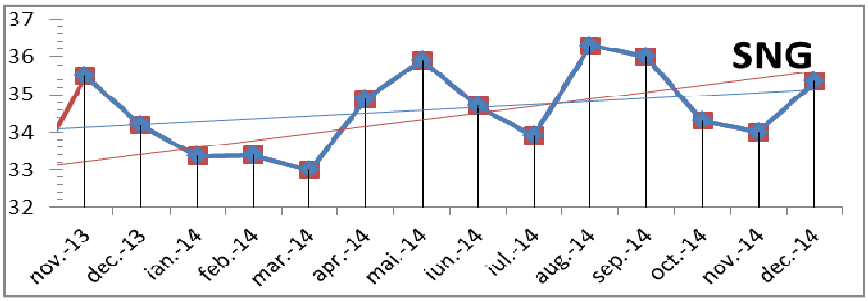


Figure 2

BET index evolution

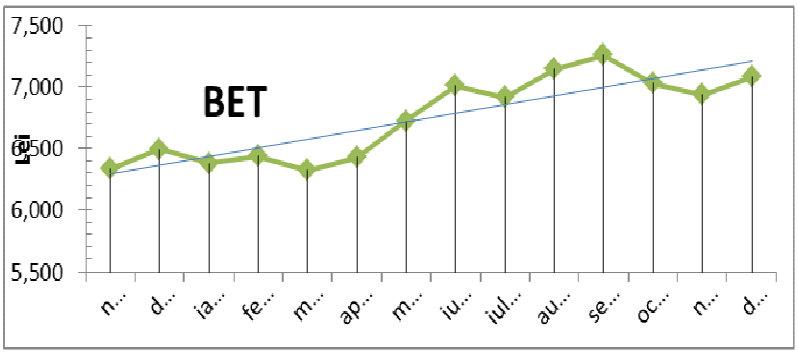
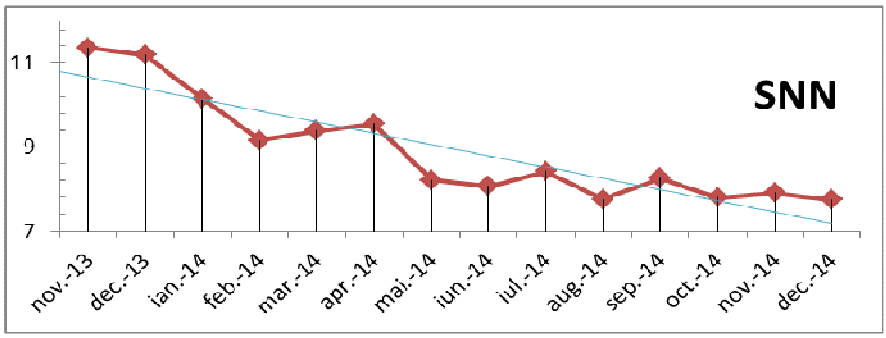


Figure 3

SNN stock performance



As can be observed from Figure 1, the stock of SNGN ROMGAZ SA had a fluctuating price evolution in the analyzed period, but if we observe the trend line (marked with blue) it was overall ascending. Also, the price fluctuations, especially the minimum and maximum spikes, have a correspondent in the evolution of the BET index in Figure 2, concluding that this variations can be attributed to the evolution of the national economy and current events that have perspired in the analyzed period. It can be observed that the trend of economic growth is more pronounced for the whole capital market, represented by the BET index, than for the SNG stock. In conclusion we can identify the premise for the phenomenon of poor short run performance for IPO's in the first 5 years of trading, comparative to the rest of the market, according to the model proposed.

If we take into consideration the price of these shares in the initial public offering as a starting point, for which an underpricing of 15% has been calculated, we can observe that the new trend line (marked with red) of the price is much more similar to the one of the BET index. That is why, if we start from the premise that this company should have an economic growth comparable to the average of the national economy, we can observe that the price established in the initial public offer was much closer to a fair market value considering the normalization of the price that is generated by the capital market (offer and demand).

In contrast to the stocks of Romgaz, the ones of the company NuclearElectrica, Figure 3, had a pronounced negative trend, being the exact opposite of the trend registered by the stock market in the same period of time. Thus, taking into account the premise of adjusting the value of a share in a market of free capital at it's real

value, we can conclude that the stock issued by NuclearElectrica by initial public offering were actually overvalued. The low underpricing, calculated at only 3 %, can be explained, most likely, by an increased initial interest of the investors in these shares.

4. Summary

For the two IPOs analyzed, the degree of underpricing has been identified as 15% for Romgaz and 3% for NuclearElectrica. The wide variation between these two values, and low sample available for analysis, only 3 IPOs successfully deployed in Romania in the last five years, makes it impossible to calculate or estimate a specific degree of underpricing for the Romanian capital market that would be relevant statistically.

From the empirical analysis of the short-term evolution of the two shares examined in comparison with the economic development of the capital market (represented by the B.S.E. BET index), it can be observed that Romgaz had a much lower than average growth, while NuclearElectrica registered a significant decrease of approximately 32%.

In the case of the shares issued by Romgaz, if you don't take in account the phenomenon of underpricing and for the starting price of the analysis we consider the price from the initial public offer, the adjusted growth trend is the same as the one recorded by the capital market. Thus the underpricing registered was most likely generated by the huge interest among investors. Considering the normalizing process for the value generated by offer and demand, the price stated in the offer was actually very close to the real value of these securities. Also, if you consider the closing price of the first trading day as the starting price of the analyses, the resulted decreased growth trend compared with that of the capital market, we can identify the premise of the phenomenon of low short-term performance (5 years) of shares issued by public offer compared to the rest of the capital market.

Also, the increased interest generated among investors may explain the degree of underpricing of 3% registered by NuclearElectrica shares.

Thus, it can be seen that the stock of Romgaz was offered for sale at a real value, and the stock of NuclearElectrica was actually overvalued. The success of both IPOs and registered underpricing phenomenon can be attributed to high interest shown by investors because these IPOs were the first ones successfully deployed in

Romania in the last 5 years. The characteristics of initial public offerings, identified by Jay R. Ritter, apply, on the basis of this empirical analysis, for the IPOs conducted on the Bucharest Stock Exchange, although, because of a very small sample, the results pertaining to the characteristics of the underpricing phenomenon specific to the Romanian capital market cannot be considered statistically relevant.

Acknowledgement

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CONNECTING CORPORATE GOVERNANCE TO COMPANIES' PERFORMANCE BY ARTIFICIAL NEURAL NETWORKS

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Abstract

The objective of this paper is to demonstrate the utility of Artificial Neural Networks in connecting the corporate governance variables, among financial information, to companies' performance. We have considered two well known indicators for estimating companies' performance (Tobin's Q ratio and Altman Z-Score) and we used them as target variables for classification using the neural networks. The results proved to be robust after experimenting with three different datasets, containing information on 1400 companies from three stock indexes: S&P 500, STOXX Europe 600 and STOXX Eastern Europe 300.

Keywords: Artificial Neural Networks, classification, corporate governance, Altman Z-Score, Tobin's Q ratio

JEL Classification: C63, C90, G32, G33

1. Introduction

The prediction of companies' performance is a subject of great interest in the stock markets investment decision process. Different quantitative methods were adopted during the years in order to fundament the decisions of buying or selling a certain stock, including the fundamental analysis of the underlying company and technical analysis of the price evolution.

When analyzing financial data for a certain company, we obtain an image of the past, trying to extrapolate it in the future, to identify trends and flags. But how will the performance of the company be affected by a change in the corporate governance policies or practices? In the fast changing world of investments one cannot wait for the next financial reports in order to answer this question, but needs models to evaluate the impact of such changes.

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In our paper we develop a model using Artificial Neural Networks (ANN), trying to evaluate the relationships between the corporate governance variables, the financial data and some wide known indicators like the Tobin's Q (Tobin, 1969)(estimating the performance) and Altman Z-score (Altman, 1968)(estimating the bankruptcy risk).

We use a dataset containing 1400 listed companies, divided according to the three indexes to which they belong: S&P500, STOXX Europe 600 and STOXX Eastern Europe 300, covering in this way three different regions of the world. We aim to identify the most important corporate governance variables for each data subset and to assess the differences.

The remainder of the paper is structured as follows. Section 2 is dedicated to the literature review; section 3 presents the artificial neural network methodology for learning the relationship between the variables; in section 4 we present our findings following the experiments. We present our final conclusions in section 5.

2. Literature review

The use of Artificial Neural Networks was adopted in many fields to solve complex problems, being recognized for its prediction power and robustness. Compared to other data mining methods, such as decision trees and regressions, the ANN perform better in terms of accuracy, but due to their "closed-box" nature are much more difficult to explain.

The literature in this field shows us the interest in identifying different modelling methods in the finance and corporate governance fields. The related work can be categorized into two directions. One aims to enhance the fraud detection methods by using machine learning models, while the other is focused on assessing risk or performance. The general opinion in both categories is that by adding corporate governance variables to the models, their accuracy improves.

Fanning (1998) built a model for detecting fraud made by the management by altering the financial results and provides empirical evidence for a selection of flags related to frauds. Turnbull (2002) uses a model ground corporate governance in the field of cybernetics. Its main findings sustain the idea that a unitary board is not reliable to govern complex companies.

Kumar (2006) uses ANN vs linear models in order to predict credit risk, using the financial data available. It shows the results obtained by employing ANN (instead of linear prediction models) are

superior in terms of both training and validation. They conclude that ANN are more suitable for large datasets.

Polsiri (2009) uses ANN and logit models to predict companies' distress on the Thai listed companies during the East Asian economic crisis. The study emphasises the importance of corporate governance variables in predicting companies' distress. The classification models global accuracy was high for both approaches, suggesting the results could be considered valid as signals for companies' distress.

The paper of Chiou (2010) proposes the approach of finding the relation between the corporate governance and the pricing of the initial public offerings by employing the ANN as a learning method. Their results show that using the corporate governance variables among the financial variables, the prediction accuracy increases, concluding that corporate governance is closely related to the price of the initial public offering.

Nor (2011) proposes a stock market trading strategy based on corporate governance variables. It investigates whether this approach can return economically significant results. ANN are used for learning the model and the results show superior returns than the classic benchmark buy and hold strategy. The study uses data from the Malaysian stock market and also refers to the information efficiency on this market.

The relation between ownership structure of a company and the dividend yield is learned by Soni (2011) using ANN. The papers shows evidence from the Indian stock market for a period of five years. The results show that individual investors presence in a large proportion in the shareholder structure is negatively impacting the dividend yield, while companies with banks and financial institutions as shareholders relate to a higher dividend. The study also shows that foreign investors in the shareholders do not have a significant influence on the dividend policy, suggesting their neutrality in this matter.

In a more recent study by Chen (2014) several data mining methods (decision trees, neural networks, random forest) are used in order to detect fraudulent financial statements, considering also corporate governance variables. The results show that introducing the corporate governance variables in the model the classification results improve. The study was concerned companies from Taiwan. Financial crises are also subject to data mining prediction. Li (2015) is using corporate governance variable as predictors along with financial data available. Their results are similar with those previously

mentioned in terms of usefulness for the corporate governance variables, which provide better prediction results if used together with other independent variables.

Zhang (2015) proposes a methodology for creating sustainability reports for organizations, considering economic, environmental, social, and governance indicators. The paper presents ways for using the neural networks as classification method for the financial position of a company.

The relation between the corporate governance practices and voluntary financial information disclosure for the most important French companies is studied by Botti (2014).

3. Classification with Artificial Neural Networks

The ANNs are widely used to solve complex, nonlinear hypothesis. They can model shapes that are otherwise difficult to build using the other classification methods. Methods like linear regressions have limited learning abilities when dealing with many features, especially when we want to model the interactions between these features. If a regression would imply quadratic or cubic terms, the number of resulting feature would grow exponentially. The regression would become soon impractical because of increasing needs in terms of computation. Because of the complex form of the ANNs it is difficult to explain the models built, which are regarded as “black-boxes” by many. This is a result of the hidden layers, and the lack of transparency of the learning algorithms which computes the weights of the variables in the layers.

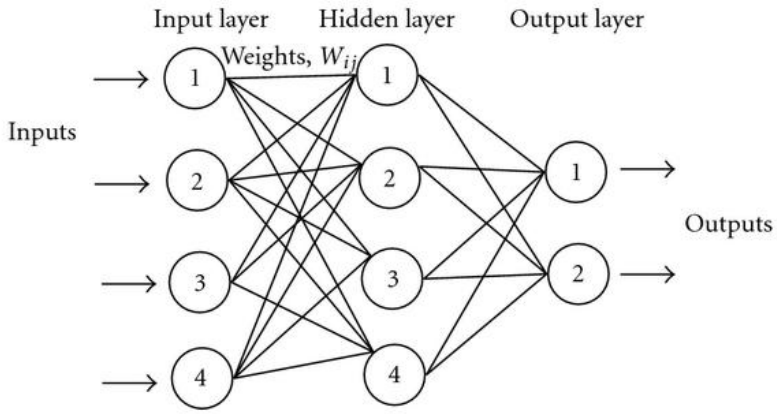
In Figure 1 we show an example of ANN with one hidden layer and two classes as outputs. In the input layer we have the initial values of the variables. Their influence is transmitted to the hidden layer by weighting each variable in order to obtain the best possible classification for the output layer.

The steps for training a neural network are the following:

1. Weights initialization (randomly);
2. Forward propagation;
3. Cost function definition;
4. Back propagation;
5. Optimization function for minimizing the cost function.

Figure 3

An ANN example



4. Experiments and results

In order to apply the neural networks methodology we had to prepare the datasets for learning. In the knowledge discovery process (Fayyad, 1996) this step represents the data pre processing and transformation phases.

Figure 4

KDD process (Fayyad, 1996)

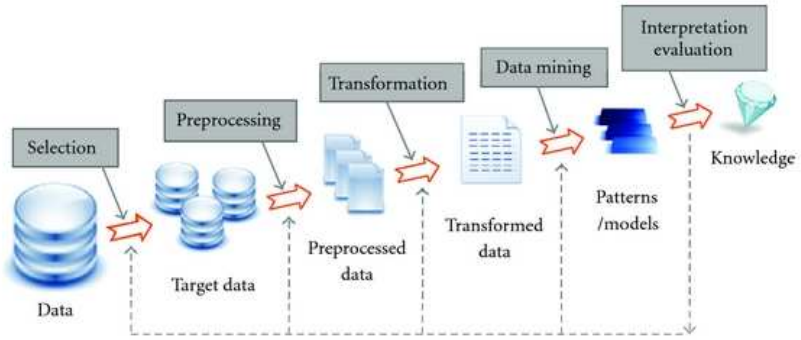


Figure 2 depicts the entire process, showing the steps needed in order to obtain the knowledge, but also the cyclic character of this type of research. After obtaining the results, one can return to a

previous step in order to adjust some parameters, until obtaining meaningful and robust information.

Our datasets were extracted according to the composition of the three stock indexes chosen: S&P500 (SPX), STOXX Europe 600 (SXXP) and STOXX Eastern Europe 300 (EEBP). The total number of instances was 1400, and the initial number of variables was 52.

The target variables for our experiments are Tobin's Q and Altman Z-Score. Tobin's Q is used as a measure for the companies' performance, while Altman Z-Score is an indicator for the financial distress. The following two formulas (1 and 2) show the way to calculate each of the two indicators.

$$\text{Tobin's Q} = (\text{Market Cap} + \text{Total Liabilities} + \text{Preferred Equity} + \text{Minority Interest}) / \text{Total Assets} \quad (1)$$

$$\text{Altman's Z-Score} = 1.2 * (\text{Working Capital} / \text{Tangible Assets}) + 1.4 * (\text{Retained Earnings} / \text{Tangible Assets}) + 3.3 * (\text{EBIT} / \text{Tangible Assets}) + 0.6 * (\text{Market Value of Equity} / \text{Total Liabilities}) + (\text{Sales} / \text{Tangible Assets}) \quad (1)$$

As independent variables we have chosen 50 financial and corporate governance variables. A list of selected variables can be found on Annex 1. Our objective is to build a model that can incorporate the information regarding both financial and corporate governance in relation with the two dependent variables. In this way, one could easily verify if certain changes in the corporate governance policies or practices could affect the performance of the company and the default risk.

After conducting a descriptive analysis of the data we defined the necessary steps to take in order to clean the data and prepare it for the learning algorithm.

The datasets contained outliers and missing data that we had to treat. We eliminated the instances containing outliers and replaced the missing data with the average value of the specific variable. Also, in order to facilitate the computation, we normalized the values for each variable, using the feature scaling shown in the following formula:

$$X' = \frac{X - \mu}{X_{mx} - X_{min}} \quad (1)$$

In this way all the variables will be brought into a certain range. This is useful in order to speed up the learning, without affecting the accuracy of the classification.

The neural network contained one hidden layer and the maximum number of epochs was set to 500. The validation threshold was set to 20. Due to the limited number of observations, we preferred the 10-fold cross validation method for training and validation.

We can note the imbalance between the classes of target variables, which can lead to poor classification for the class with less observation. In order to tackle this aspect, we employed a method for oversampling: Synthetic Minority Oversample Technique (SMOTE), proposed by Chawla (2002).

The results after training the neural networks for the three datasets having the Altman Z-Score as target variable are presented in Table 1.

Table 2

Altman Z-score as class

Dataset	Correctly classified instances	Coverage of cases (0.95 level)	Precision Class 0	Precision Class 1	Precision Class 2	ROC Area
SPX	84.3938 %	90.9964 %	0.875	0.817	0.836	0.936
SXXP	76.456 %	84.8823 %	0.831	0.68	0.767	0.906
EEBP	77.2523 %	86.4865 %	0.876	0.706	0.721	0.882

We can note the overall accuracy of the classification is robust, the SPX index dataset showing the best overall performance. The EEBP dataset contained more missing data than the others, this aspect being a major drawback for the classification accuracy.

Table 2 shows the results obtained after training the neural networks for classifying the datasets having Tobin's Q ratio as target variable. The results are showing a classification slightly less robust than the previous case, where Altman Z-Sore was the target variable. The precision is consistent for the post classes, showing about the same values for each of them. Surprisingly the highest ROC area was

obtained for the EEBP dataset, although the best overall classification was obtained for the SXXP dataset.

Table 3

Tobin's Q Ratio as class

Dataset	Correctly classified instances	Coverage of cases (0.95 level)	Precision Class 0	Precision Class 1	ROC Area
SPX	64.1129 %	77.8226 %	0.64	0.642	0.71
SXXP	76.6387 %	86.3866 %	0.784	0.751	0.848
EEBP	70.0337 %	81.8182 %	0.811	0.805	0.893

5. Conclusion

In this paper we demonstrated the use of artificial neural networks in classifying three datasets containing information regarding financial information and corporate governance practices from 1400 companies located in Eurozone, Eastern Europe and United States. The results show the neural networks can be successfully employed in classifying the companies using financial and corporate governance information in order to estimate their bankruptcy risk or their general performance according to two wide known indicators: Altman Z-Score and Tobin's Q Ratio.

For future development we consider using data mining methods for multi target prediction in order to classify the date according to both target variables at the same time and observe the relationship between them.

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IMPLICATIONS OF INSURANCE DISTRIBUTION DIRECTIVE ON THE COSTS OF TRAINING IN ROMANIA

Laura Elly NAGHI, PhD*

Abstract

Taking into consideration the latest developments in the area of consumer protection at the level of European Union concerning the intermediation of financial products, the national insurance markets are striving to adapt to the requirements of the professional development of the personnel offering intermediation services to the final consumer. The continuous professional development (CPD) systems have to be implemented also on the insurance industries, starting from the experience of the banking or investment sectors, and thus the interest of the insurance undertakers' into designing training budgets that will be sufficient for the requirements of the regulator. The paper is aimed at presenting the situation existing over Europe and coming up with proposals that are already in motion on the Romanian market.

Keywords: CPD, training, consumer protection

JEL Classification: G22, I25

1. Introduction

The European insurance industry has the largest share at global level, of 33%. After the crisis, between 2008 and 2012, the economic environment where insurance companies operated was a challenging one. This European context was characterized by low interest rates, and limited resources of people, who could not afford to spend money on insurance, even though financial markets recorded some visible improvements. The gross premiums written by European insurers in 2013 totaled €1.119 trillion ($1.470 trillion), a 2.7% increase over the previous year, according to statistics published by Insurance Europe (2014), but impacts loom from upcoming Solvency II rules. The 2013 increase was due to factors such as the depreciation of the single currency and decreasing oil prices. This

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economic context determined an improvement on the insurance market, as reflected in the value of gross written premiums.

European insurance market was heavily changed due to the requests of the consumers of financial products that required to have more protection from the part of the intermediaries that were offering products, sometimes tailor-made, specifically for them, without full disclosure of the terms and conditions. One step further was the implementation in the year 2002 of the **European Insurance Mediation Directive** (Directive 2002/92/EC of the European Parliament and of the Council of 9 December 2002 on insurance mediation) that would bring about a reassurance for the customers to have protection from the insurance sellers, according to Bedhouche J. (2014). The Insurance Mediation Directive ("IMD1") introduced a pre-condition for registration that insurance and reinsurance intermediaries meet "strict professional requirements in relation to their competence, good repute, professional indemnity cover and financial capacity requirement". In addition, Article 4(1) provided that insurance and reinsurance intermediaries must possess "appropriate knowledge and ability, as determined by the home Member State of the intermediary".

After more than ten years of the IMD 1, the requirements to adapt to the new world of financial products that involve not only traditional products but also unit-linked products, investment products, private pensions products – all including an investment component on the long term with significant exposure for the customer, brought about the necessity to adjust IMD1 to the now called Insurance Distribution Directive (IDD or IMD2) as it is known on the market. The final objective of the directive is to protect the consumer but in the same time to increase the level of professionalism of the insurance distributors.

This is where the burden for the insurance companies will become obvious – due to compliance reasons, they are more interested in budgeting the compulsory training than the competence-based training that are more efficient for their employees.

2. Overview of the European Insurance Distribution Directive

The Insurance Distribution Directive represents a set of guidelines concerning the assurance of consumer protection by offering professionalized products by personnel that have appropriate knowledge and competencies. The directive serves the protection of customers' interests that individuals / companies providing insurance or reinsurance mediation are registered in their home EU country

(which allows them to do business elsewhere in the EU). The objective can be achieved only by offering clear explanations to customers on a given advice.

The national regulators, the European Commission, the insurance companies, in fact all providers of financial products must ensure a certain level of professionalism and competence among insurance intermediaries – this is one of the priorities for the following five years, taking into consideration other legal provisions concerning the insurance activity (such as Solvency II requirements for a full disclosure and transparency of the activities performed by the insurance undertakers). The companies must show respect for **minimum professional requirements** such as:

- appropriate knowledge and ability
- good repute
- professional indemnity insurance or other comparable guarantee
- sufficient financial capacity to protect customers.

Insurance intermediaries are key actors in the process of selling insurance products in the EU. They are facilitating entry into the market, helping new insurers reach a wide client base without having to incur the costs of building a distribution network. But not only that, the intermediaries are the ones assisting with claims-related services and policy administration. Over the last 10 years, the role of the insurance intermediaries has increased, in terms of range of services provided for the final client of insurance products – the services and guidance offered are expanding over the service of sales. They also help insurance customers by:

- identifying the risks customers face
- ensuring that customers take informed decisions about the risks they wish to insure
- designing new and innovative solutions
- reducing customers' search costs
- providing personalized advice
- assisting customers with claims-related services and policy administration.

Insurance products are also sold **directly** by some insurance companies and bank-assurance. The channels of selling insurance products have also suffered a significant diversification – beside the classical sales force, the insurance products are nowadays offered through banks, but there are some sellers of insurance products, such as **car rentals** and **travel agents**, exercise this business activity on ancillary basis. The occurrence of these types of intermediaries

are bringing forth concerns for the training of these persons and also for the costs of training that should be included in the annual budgets of their employers or other concerned companies.

3. Implication of IDD on the national insurance training programs

European Commission (2012) gathered the existing information of all national markets concerning the application of IMD1 referring to the insurance of the professional knowledge of the insurance intermediaries. The survey that was made public at the end of 2012 was in fact a mapping exercise carried out by EIOPA Members from March-September 2012 on the types of industry training standards applicable in different national jurisdictions.

As mentioned before, the implementation of the IMD1 was left at the level of the national regulator to be observed and adjusted, and therefore a multitude of differences concerning the types of training, the duration of training, the necessary proof of training was recorded over time.

As a general conclusion, knowledge and ability requirements were generally seen a **combination of academic and professional experience** , but, in some countries such as Norway or The Nederland, academic qualifications could be waived if professional experience was long enough. In many of Members States, the **requirements for knowledge and ability are more stringent for insurance brokers** than insurance agents. There were some exceptions such as Germany, Greece, Italy, Malta where the requirements for knowledge and ability are more stringent for agents and brokers than for other categories of intermediaries.

One aspect that was visible in all countries of the European Union was referring to the evaluation of the training carried out by the insurance intermediaries - knowledge and ability were only **assessed by national competent authorities** before the first registration of the intermediary.

The national regulations on the area of professional development included also the issue of **life-long learning** or **continuous professional development** (CPD). Thus, there were some countries such as Bulgaria, Hungary, Island, Malta, Latvia or Lithuania where there was no formal requirement for continuous education. In Austria and Cyprus, the introduction of a system was looked upon in 2012 (in 2014 Cyprus implemented a CPD system in the insurance business).In other jurisdictions, continuous education was seen as a formal requirement but the amount of continuous education and the duration was established differently. For example,

in Nederland, Poland and Romania (every 3 years); in Slovakia (every 4 years); in Belgium (30 hours for brokers /agents and 20 hours for sub-agents over a period of 3 years); Czech Republic, Greece (approximately every 5 years), Ireland (15 hrs/year), Italy (30 hrs/year); UK (35 hours/year for investment insurance mediation only).

Apart from some exceptions, there were a limited availability for intermediaries to carry out updating courses through e-learning. The **responsibility for assessing knowledge and ability at national level** varies considerably between assessment being carried out by national competent authorities only or in tandem with undertakings/professional associations, or through delegation to professional associations in some jurisdictions or to the intermediary/undertaking itself.

According to European Commission (2013), CPD represented a series of study activities that competent authorities would reasonably expect distributors to carry out to ensure that they keep their knowledge and ability updated. The methods of staying updated for each of the intermediaries registered in the national register would vary from an examination taken with recognized schools or professional bodies, or simply by proving the attendance.

The Insurance Distribution Directive proposal in 2013 introduced an explicit obligation for insurance and reinsurance intermediaries and members of staff of insurance undertakings carrying out insurance mediation activities to "**update their knowledge and ability through continuing professional development in order to maintain an adequate level of performance**". The general conclusion of national parties concerned with the training of the employees was that e-learning or video-linked programs to reduce costs in order to provide training offered by employers, or an appropriate professional training/ educational body, and thus to maintain a sufficiently high level of knowledge and ability. The CPD is effective when undertaken on a periodical basis, regardless if this is through a formal requirement or not.

The European guidelines concerning the **curricula of the training** for the intermediaries covers not only professional knowledge (e.g. insurance legislation, anti-money laundering legislation, market, products , assessment of consumer needs), but also ability (e.g. risks perception, underwriting process, claims procedures) and ethics (codes of conduct/ethics).

From these points of view the implementation of IDD requirements on the insurance market should be quite easy to

perform. Except for the **increased costs of training** that the insurance companies had and still have to support in their annual budgets in order to prove their personnel development. In the end, these costs are reflected in the final price of the product – but is it really necessary to have higher costs just to have a better and more professionalized employees for the customers? Is it really the needed effort to ensure that the final customer is protected sufficiently?

On the other hand, the compulsory form of training that was required through law made the management of the insurance companies to focus only on achieving those national requirements for intermediaries, meaning there has been a **significant decrease in the volume of professional training for other positions** in the companies, such as legal department or actuarial department. Even if they are not in the front line of the company, these jobs should also have certain concerns to be taken into consideration – professional development is necessary for all the types of employees working in this highly exposed domain.

Another effect of IMD1, and consequently of IDD, is referring to the idea that the companies strived to obtaining only the **minimum requirements of training** for their personnel. No one was any longer concerned with achieving an adequate level of training – in this regard, even from 2012, the Chartered Insurance Institute from UK brought forth the concern for a limitation of all persons working in the sales force that would no longer seek to improve their knowledge, but only to "tick" the required number of training hours.

There is also, the issue of mutual recognition of national training. There is very **little experience amongst national competent authorities with receiving applications for mutual recognition of knowledge and ability requirements**. Reliance is often placed on existing EU legislation on professional qualifications and screening of applications may be carried out either directly by supervisors, by national qualification bodies or by professional associations. At European level there is no longer a specific committee to take care of the professional development – as the former Social Relations and Training became Social Relations Committee). The only initiative existing at present in this field of professional development in insurance that offers a certain level of acknowledgment of recognizing the levels of knowledge and abilities of national intermediaries is EFICERT –an international platform of local insurance institutes, supported by national professional associations. The problem with recognizing forms of training in insurance does not lie in the academic program where the system of

European Transferable Credits can be used as a benchmark, but the problem lies with the short term types of training that are not so regulated at international level – how to quantify the abilities and knowledge acquired during a three days conference organized the national association of insurance in Austria for an intermediary that intends to prove his CPD in Germany?

Another effect of IDD implementation refers to the fact that IDD brings about the minimum qualifications for those offering insurance products even without working in the industry. Local markets are to implement specific systems that would emulate the local situation. Already in certain countries, the regulator of the market imposed a minimum level of knowledge for those offering insurance products that are belonging to adjacent activities (Germany, Austria). In other countries, such as Romania – there are debates also in the area of claim settlement for motor insurance – CEETAR initiative that brings into discussion the entities required to monitor the application of IDD requirements of the intermediaries.

After the last proposals on the text of IDD in March 2015, there were noticed some **developments**.

- Thus, Continuous Professional Development systems are already implemented in Germany, Cyprus or Ireland taking into consideration certain number of training hours / CPD points that each intermediate should have in order to maintain his/her validation on the insurance market.
- For CPD systems minimum EQF (European Qualification Framework) for those involved in the distribution of insurance products should be EQF 3, setting thus a common ground of recognition at the European level of academic training.
- The training curricula of IDD (the last version) covers not only professional knowledge (e.g. insurance legislation, anti-money laundering legislation, market, products, assessment of consumer needs), but also ability (e.g. risks perception, underwriting process, claim procedures) and ethics (codes of conduct/ethics).
- The training should be maintained and updated. It is suggested that CPD should be undertaken regularly (for example, as a minimum, a cycle of 3 to 5 years).
- Last, but not the least, the professional training should be appropriately evidenced and that evidence should be retained. The competent authority or professional body should review evidence demonstrating achievement of CPD, on a regular basis.

There were some proposals made by Germany suggesting a difference to be made between the **different types of**

intermediaries: insurance personnel people working outside the industry offering insurance products. The plan the German association of insurance companies. The difference in terms of the training requirements should be focused on the number of CPD points – for example, one training day = 1 CPD point for insurance personnel and only half of training day = 1 CPD point for those working outside industry. The distinction is generated by the different levels of responsibility of these distributors and also the waivers of their jobs. Moreover, Germany insists that both types of training to be taken into consideration:

- Formal education
- Informal education – research studies, conferences, workshops organized by insurance industry or others

In the end, the Insurance Distribution Directive is offering just a regional frame of guidelines. The important issues to be taken care of are in the implementation phase – each national regulator will interpret these guidelines in their local legislation- the way in which this interpretation shall be done will be of significant importance both for the insurance market, the final consumer and why not the entire financial sector.

4. Study case: Insurance training in Romania

According to PriceWaterhouseCoopers (2011), insurance and pensions sectors in Romania have been described as “small, but growing in importance” and facing important development challenges. In 2014, the insurance penetration degree was of 1.21% of GDP, at a rather low level comparing to the European average but still one important for the south part of Europe. The volume of grow written premiums decreased in 2014 at 2 billion EUR in 2014, from which approximately 51,2% din total PBS were cashed in only in Bucharest. The decrease in the premiums was caused by a decrease in the non-life insurance market by almost 6% and in the life-insurance segment by almost 10%. In terms of weight of the two categories of insurances, the non-life insurance represents approximately 80% of the gross written premiums collected in 2014. As usually, the motor insurance has the highest weight in the general gross written premiums collected (43.61%). The life-insurance market represents around 20% of the total value of the gross written premiums.In terms of average expenditure with insurance, in 2014, a Romanian paid 93 EUR/capita (versus 1900EUR European average).

In 2013, a study made by a local marketing company revealed that Romanian have no trust in the financial institutions, only 29% of the customers of financial products showed any interest in this type of

products, based mainly on the level of financial education they have and also on the personal experience with this field. This is the reason for which the national regulator, the Financial Supervisory Authority proposed a series of actions determined to improve the level of financial education of Romanian customers and also continued to monitor the implementation of the IDD requirements for intermediaries, as mentioned by Rangu (2015).

Concerning the focus of the Romanian Financial Supervisory Authority, in 2015, there are several directions to be observed:

- Information of the consumer concerning his rights
- Counseling of the consumer for application of complaints
- Financial education of the consumer – financial markets, financial products, instruments, operations
- Increased awareness of the methods to avoid fraud in insurance

The national authority had the role of interpreting the requirements of the IMD1 so that all the insurance intermediaries had the obligation of complying with the curricula proposed at European level. Thus, starting with 1st of September 2011, persons intending to works as intermediaries of insurance products, have the obligation to have a qualification certificate in order to be employed as a sales personnel by an insurance company or an insurance broker. Moreover, employees working in the sales department must prove each 3 years/ 2 years for the managers of teams/ managers of brokerage companies the completion of a continuous professional development program, approved by the Romanian Financial Supervisory Authority.

The **curricula** for this type of compulsory insurance training takes into focus the following:

- Legal framework of insurance in Romania referring to the insurance activity but also to the consumer protection, personal data protection
- Insurance basic concepts and technical elements
- Communication and negotiation techniques in insurance
- Sales techniques for insurance products.

The evidence of a certain level of knowledge and abilities is to be proven by taking a written examination at the **Romanian Institute of Management in Insurance** – founded by the Romanian Regulator- that is in charge of the examinations and also of the national register of the intermediaries in Romania. The lack of the

qualification certificate brings about exclusion from the national register and also the interdiction to sell insurance products on the Romanian market.

At this point, there are 12000 employees and approximately 70000 intermediaries that had the obligation of obtaining the compulsory training in insurance. During the period 2011-2014, the focus of all insurance companies was on training the existing sales force, thus the general **effects** of the national legislation were:

- Increased budgets for compulsory training- the lack of the certificate would have brought them out of the market, in the impossibility to sell for new customers.
- Reduction of intermediary contracts – just for those performing, the company provided coverage of costs of the training program, the ones with small results were let off. The process proved itself a good filter of performance among the existing sales agents/ brokers
- Reduced training budgets for other types of personnel – the increased amount of budget allocated for the compulsory training generated heavy reductions in the other areas (conferences, team building, specialized training a.s.o).

There were also other effects such as the **reduction in the quality of professional training** – the necessity to prove 50 training hours, plus the passing of an examination held by only one entity became just a “thick on” process for all those involved (sales agents, brokers, human resource manager). The quality of the training was not observed – no efficiency ratios were computed for this type of training.

On the bright side, the market observed an **increased number of training entities** authorized by the Romanian Financial Supervisory Authority, just for the insurance markets, meaning fees that were paid for the authorization of the programs, of the e-learning platforms, for the authorization of the trainers.

In terms of **CPD**, the existing legislation stipulates that the Romanian intermediaries and/or their executives must make prove of the following:

- Minimum 20 hours of CPD training, 35 hours for managers – the ways of obtaining these numbers are: in-class training provided by an authorized training entity in insurance, e-learning platforms, online training
- The passing of the examination – the rules are set by the Authority

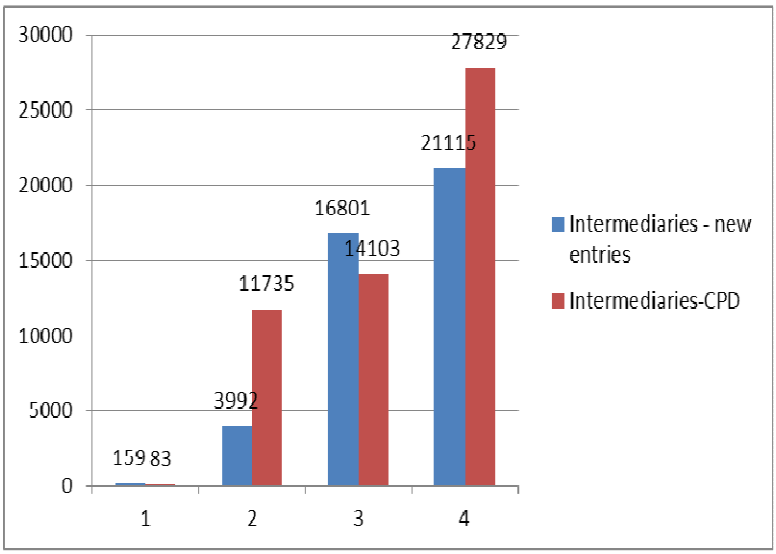
- Curricula includes legislation, principles, technical elements, ethics, sales techniques, insurance products, consumer protection, money laundry. The CPD training implies a development / an update of the initial training for those working in the industry. There are certain topics that are new at this level concerning ethics and professionalism or money laundry.
- As for managers, the curricula includes beside the topics obligatory for any intermediary certain specific topics that are related to the tasks of managing activities/ persons , such as HR management, financial and technical reports, motor claim settlement

In terms of graduates from the compulsory programs, the following situation was compiled based on the registers provided by the entity designated to carry on examinations in order to issue certificates for intermediaries and their executives. Thus, for intermediaries there may be noticed an significant density in the years 2013 and mostly 2014, as the insurance undertakers postponed to maximum the costs of training their personnel – 51.08% of the 95,817 intermediaries were certified in the last year allowed by the national regulation for certification.

Taking into consideration an average cost of training of 350 RON paid by insurance companies on in-class training or online training, a total cost of 33,535,950 RON at the level of the industry was recorded. Additional to this cost, the training budgets of the companies also supported the examination tax of 250 RON/person, meaning a total training budget for compulsory education of 57,490,020 RON, for the period of 2011-2014, an incredible cost if we take into consideration that the other forms of specialization training for the same period was 20 times less (based on number of participants).

Chart 1

Evolution of number of intermediaries certified

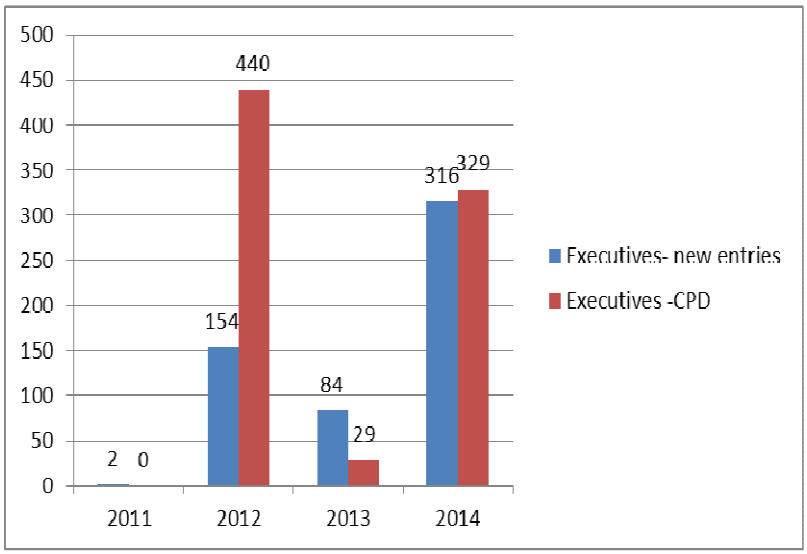


For executives it may be noticed a different pattern – the responsibilities in their job description reflected also in the taking of certification – 2012 and 2014 (the last year when they were obligated to register) represented the peak in the certification process. At the end of 2014, there were registered a total of 1,354 persons working as executives in insurance industry and being recognized (through their certification) by the national regulator to perform managerial activities.

On average, the investment in the certification training for executives rose to an average of 900 RON/person (including the certification tax) which for the period analyzed generated a total budget of 1,218,600 RON. Comparing this figure with the competence-based training for executives, the ratio is more favorable than that of the intermediaries, meaning compulsory training in number of participants was 10 times only higher than the number of those seeking adequate professional training during this period.

Chart 2

Evolution of number of executives certified



A market of almost 14 million EUR in the last 4 years does not necessarily mean a bad result; on the contrary, it signifies a market that is operating, is striving to develop. The important issue is to combine this form of training with other forms, focused more on the skills and abilities to be used than only the formal compliance education.

The results of IDD shall be seen in the following years to come – it is in my opinion that the system of compulsory training should be revised, in terms of accepting also non-formal training (such as participation to workshops or events organized by the national association of insurance companies or brokers, conferences). The number of hours should be correlated with CPD points and thus the requirements should be expressed in points – taking into consideration educational systems that have been implemented with success in other countries with large experience in insurance and also in professional education.

The system should take into consideration also academic training – a master program of 2 years should be equivalent with a form of CPD, especially for managers, even though universities are not authorized on the insurance market. What I mean to say is that, in terms of education, the insurance regulator should observe the authorization given by the national ministry of education and for the

professional training, the authorizations given by the national ministry of labor.

The insurance companies and the insurance brokerage companies should be careful about the achieving of compulsory training – it is in my opinion that a "ticked" training has zero relevance for the knowledge and abilities of a person – maybe a combination of compulsory and competence training should be in the focus of human resource departments of the companies, even though such approach would increase significantly the costs in the annual budgets.

5. Conclusions

There is obviously a need to adapt to the European requirements – the different types of persons offering financial products should be taken into consideration either in terms of knowledge and abilities needed to be acquired, in terms of duration of the training programs or in the types of training programs , be it in class or online.

The Continuous Professional Development systems around Europe take into consideration either number of credit or hours, the distinction shall be clearer if informal and formal types of training will be acknowledged by the national regulators as a means to achieve their compulsory training.

The Insurance Distribution Directive will change the level of training costs for the insurance undertakers but not only for them – the partners selling products that are object to insurance products will have to consider potential costs for the training of their own sales forces.

The life-long learning for human resources in insurance does not necessarily resume to the intermediaries, there are claims adjusters, actuaries, marketing promoters, legal counselors and others that are in need of development – my concern is that the human resource department shall have difficulties in obtaining the necessary funding for them as the consumer protection means primarily the development of the front line of the companies, as a result of Distribution Directive implementation.

Not last, choosing between compliance and competence training, in theory, the answer is obvious – in practice, the reality of the last 4 years on the Romanian insurance market is more or less blurry – efficiency is brought by high quality training based on the needs of the participants; but in order to be on the market, the company must have its employees certified according to compulsory training. So, what is the solution? A combination of both, that must be recognized by the regulator without excessive forms of evaluation.

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PUBLIC - PRIVATE PARTNERSHIPS IN EMERGING MARKETS: CHALLENGES AND FUNDING OPPORTUNITIES

Iana OVSIANNYKOVA, PhD*

Abstract

We study the impact of global financial crises on structure of public-private partnership (PPP) funding during 2008-2012. The evidence in fact suggests that PPP funding changes essentially and lead to risks diversification by potential investors due to political and economic instability. As a result government has to take major project risks. Institutional investors will increasingly become major investors in the capital market, and hence potential investors for PPP projects. At the same time, the paper found that institutional investors today may play a significant role on the PPP market, which investment opportunities have essentially increased. The investment in the PPP projects is attractive for pension funds and insurance companies because PPP assets are equal to the duration of their long-term liabilities and ensure their long-term inflation hedge. In this way, we can assume that the investment in PPP via project bonds by institutional investors may be mutually beneficial decision for both the PPP development and the institutional investors' evolution.

Keywords: project finance, project bond, mezzanine finance, institutional investors

JEL Classification: E22, G23

1. Introduction

In connection with the global financial crisis and the risk aversion of investors, long-term credit market is experiencing a severe recession - to get a loan for a long-term investment project virtually impossible. At the same time, the emerging markets have a lot of projects that require long-term financing. The structure of financial markets of emerging regions is characterized by unavailability of financial instruments known developed financial markets. It narrows the possibilities of capital mobilizing for the

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creation and development of infrastructure such as transport, energy, housing, telecommunication, education and health. Infrastructure projects are most reliable for investments in financial and economic crises, because the infrastructure is the basis for economic growth and employment creation. It is necessary to involve in PPP financing conservative investors because they don't target on trading gains. In such circumstances, one of the most important ways to improve market expectations are expanding of the financial instruments list and attracting of institutional investors, such as pension funds, investment and insurance companies.

Previous studies have found that financial markets of emerging regions are poor that's why governments have to use wide range of PPP's instruments to activate investments in infrastructure projects (Bazylevich, 2009; Farquharson, Torres de Mastle and Yescombe, 2011). Inderst (2013) finds that financing of infrastructure investment requires private capital participation and underlines that institutional investors have to play a significant role in such projects. Although PPP projects are risky that's why financial markets have to offer special instruments for hedging such types of risks (Naumenkova and Gavrysh, 2013).

The remainder of the paper is organized as follows. Section 2 introduces public-private partnership: tendencies and challenges. Section 3 develops the idea of potential financial instruments and investors. Section 4 describes investment barriers and provides policy action to promote long-term investment in PPP.

2. Public-Private Partnership: tendencies and challenges

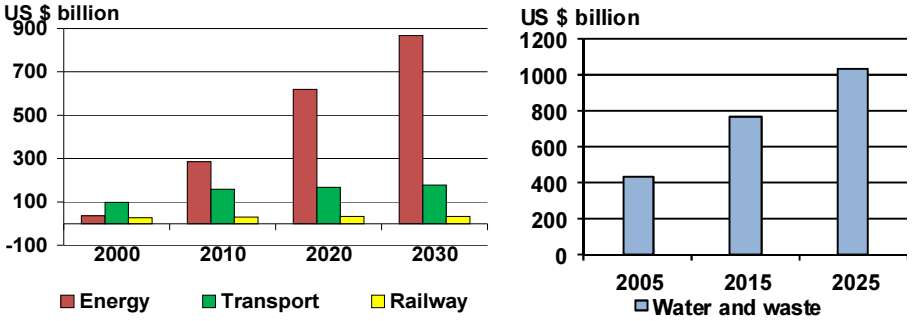
There is an urgent need in financing of infrastructure projects (such as transport, energy, water and waste, education, health, etc.) around the world. The OECD countries and EU especially underline the importance of this problem. The OECD estimated global infrastructure requirements to 2030 to be in the order of US$50 tn (OECD, 2011) (Figure 1).

In turn, the scientists calculate the significant amount of required investment for infrastructure development in Europe over the next 25 years. It is over EUR 4 trillion or EUR 350-450 billion annually. Accordingly to the survey results of the European Commission, annually EUR 9.1 bn was spent only on energy projects during 2005-2009, of which EUR 5.8 bn for electricity and EUR 3.3 bn - extraction and transportation of natural gas. The experts estimate

annual demand for investment in this sector to 2020 in amount of EUR 14 bn.

Figure 1

The average investment requirements for infrastructure in OECD countries to 2030, US $ bn



Source: author's calculation based on data from the OECD

Typically, this projects are large-scale that complexity its implementation solely by government or private company. That's why Governments around the world are attempting to stimulate the economic growth due to attracting private investment in infrastructure. Under these conditions, the tool of public-private partnership (PPP) is becoming important among government circles of these countries and widely using of all infrastructure initiatives. Despite the complexity of implementing this model and some skepticism about its efficiency and justification, the PPP is becoming a part of the political debate, including in the strategies of development and regulation, especially in the developing countries.

The public-private partnership is an evolutionarily new stage of relations between state and privet enterprises, because it can overcome limited capacity of state and local governments to finance social and infrastructure projects. This tool differs in scale and highly efficiency of resources use, inclines to innovations, implements the advantages of private ownership to improve the quality and efficiency of the public management of infrastructure.

Currently the PPP is used by almost all governments around the world, because it is a primary factor in accelerating socio-economic development, improvement quality of life and the

environment, optimization of financial, human and other resources for the implementation of the significant projects.

The public-private partnership can be seen as an instrument of state regulation of the economy and improvement the management of state property, as an approach of harmonizing relations between public authorities and the private sector through its involvement in the providing of public services. Thus, it can be used efficiently and implicitly accelerate sustain economic growth.

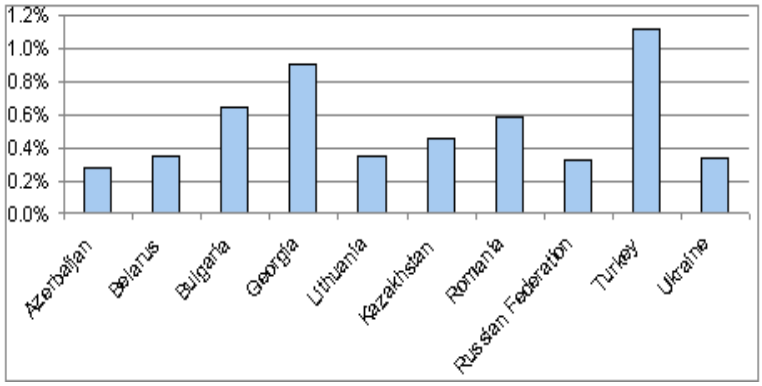
The development of the public-private partnership in all regions of the world, its widely spread in various fields and industries gives reason to assume this form of interaction between the public sector and the business as a characteristic feature of the modern economy. According to Dealogic, global investments in the PPP and number of deals are increasing every year, on average $50-90 bn per year or approximately 0.1% of world GDP. The PPP market constitutes 25% of the total project finance market, i.e. every fourth project in the world is realized on the basis of public-private partnership.

Recently, the countries of the Eastern Europe and the CIS (Poland, Hungary, Russia, and Kazakhstan) also began actively developing and implementing the public-private partnership to accelerate the economic growth. According to experts of the European Commission, Ukrainian investments needs constitute now more than EUR 140 bn. However, investment attractiveness of Ukraine PPP projects is comparatively quite low. The average level of private participation in infrastructure (PPI) in Ukraine is 0.33% of GDP, while in Turkey the figure is 1.11% of GDP (Figure 2).

There is an apparent discrepancy between the required and available investment. The financial market conjuncture is changed and conditions to attract long-term financial resources are stiffened due to the global financial crisis which has affected the project financing market, and as a result the mobilization of the necessary financial resources is significantly aggravated.

Figure 2

The average level of PPI investment in emerging markets in 2008-2013, percent of GDP



Source: author's calculation based on data from the World Bank

The potential problem with recently decreasing investments involved in the PPP implementation is obvious. The Table 1 provides statistical evidence of the PPP financial structure reflection on the changes. Generally, the ratio of debt to equity particularly differs from the pre-crisis practice and the state share or international financial institutions (IFIs) participation expectedly increases in the PPP projects during and after crises period.

Table 1

The PPP financial structure during 2006-2012, percent

Source of Finance	2006	2007	2008	2009	2010	2011	2012
Debt	79	73	73	59	56	67	66
Equity	15	21	18	19	16	17	22
Grants/ IFIs/ Government	6	6	9	22	28	16	12
Ratio of debt to equity	19	29	25	32	29	25,5	33,5

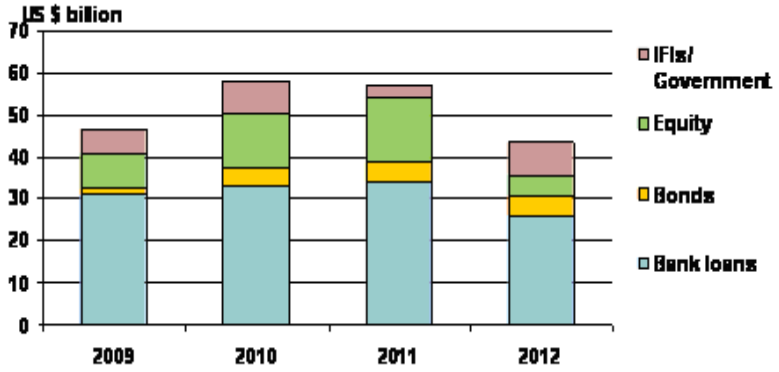
Source: author's calculation based on data from the Infrastructure Journal

Reduction of the loans availability, the main source of PPP financing globally, and sudden tidying of the lending conditions, has led to a marked increase of the debt financing cost. Therefore, the structural weaknesses in the banking sector have caused growing

discrepancy between the amounts and terms of available funding especially for long-term financing. As a result, leverage ratio of the total PPP financing has decreased that cause the actively participating of the IFIs in the PPP due to its possibility to provide financing in crises period (Figure 3).

Figure 3

The amount of investments in PPP projects by source of financing in 2009 – 2012, US $ bn



Source: author's calculation based on data from the Infrastructure Journal

3. Potential Financial Instruments and Investors

The financial structure of the PPP varies depending on the area of its implementation. According to Eurostat's, share of equity in PPP projects undertaken in education and health is only 6%, while in the public utilities and transport infrastructure it reaches approximately 20%. In developed countries, social infrastructure projects primarily are implemented via borrowings, an average 20% are bonds. Loans are more common financial instrument for economic infrastructure projects - about 75% of total borrowings.

In practice, governments use different financial instruments depending on financial market evolution. Farquharson, Torres de Mastle and Yeskombe (2011) state that the most common financial instruments for PPP projects in developed countries are stocks and bank loans, also sometimes bonds, corporate loans and mezzanine capital investment. In turn, the emerging markets frequently use stocks and IFIs loans, occasionally bank loans and guarantees, and very rarely - bonds and mezzanine capital. The potential problem for these countries is to mobilize the private capital for PPP projects

implementation, especially long-term financing in the post-crisis period. This situation is accounted for poor economic development, high cost of funding and high project risks due to countries instability.

Thus, bank lending, especially syndicated, remains an essential part of the PPP debt financing and plays primary role in its funding. Based on the above we can assume that current changes in banking regulation due to "Basel III" may affect the ability of banks to carry out PPP long-term financing. The new liquidity coverage ratios require higher spreads that force the European banks to reduce risky assets, including long-term investments in PPP projects.

Nowadays the substantial increase of required investment for the infrastructure development accounts for activation of finding potential investors and available funding.

Recently, many countries started to search for alternative financial instruments through implementation the international experience of developed countries, and conducting extensive research of the financial market and its opportunities. The US and the UK carefully studied experience of Canada as a leader of bond applying in the PPP projects. The US create federal program called Transportation Infrastructure Finance and Innovation Act (TIFIA) with fund in US $ 1 bn a year, which provide tranche on subordination basis (about 49% of project costs). Later, there was launched state program SAFETEA-LU (Safe, Accountable, Flexible, Efficient, Transportation Equity Act: a Legacy for Users) that activated bond issue for PPP projects – Private Activity Bonds and Build America Bonds. The European Commission, in turn, assessed existing financial mechanisms of funds rising and identified innovative financial instruments to support the PPP development. "Project bond initiative" was introduced throughout the European Union as a result of this research. Russia and India also started to develop actively the bond market. Therefore, use of project bonds in the PPP funding apparently has become worldwide and has increasingly attracted attention of potential investors. Managers of the PPP projects can mobilize private investment through issuing project bonds as an additional tool or alternative to the traditional bank lending.

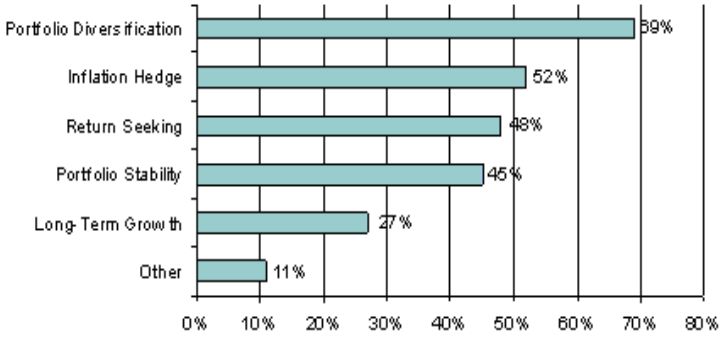
The launch and promotion of the project bonds will essentially improve the investment attractiveness of the local PPP projects and especially contribute to involving international investors. Thus, capital market will raise more dynamic, which also will lead to the institutional investors' activation and their development.

According to OECD research, institutional investors, with over US$75 tn in assets held at the end of 2010 in OECD countries alone, could be key sources of capital, financing long-term, productive activities that support sustainable growth, such as infrastructure projects. (OECD, 2011; Inderst, 2013). For example, Ukrainian institutional investors had corporate bonds in amount of 64.5 bn UAH (or approximately US $10 bn) for the period 2006-2011. And the bonds share in the investment portfolios was on average 25.5%.

Based on the analysis, infrastructure investments have a lot of attractive characteristics for institutional investors, namely stable and predictable income with lower risk, sufficient recovery rates low correlation to other traditional asset, contribution to social development. In principle the long-term investment horizon of pension funds and other institutional investors should make them natural investors in less liquid, long-term assets such as infrastructure (OECD, 2011). According to the Macquarie Infrastructure & Real Assets, the primary reasons why institutional investors choose the infrastructure assets are portfolio diversification (69%) and inflation hedge (52%) (Figure 4).

Figure 4

Reasons for institutional investors to fund infrastructure projects



Source: Rubin (2013)

Moreover, financial gap significantly increases the role of mezzanine investment in the infrastructure funding. This relatively new financial instrument has all necessary features for inclusion in the list of project financing tools, as well in the PPP financing.

The economic scientific literature defines a lot of mezzanine financing instruments, including subordinated loans, preferred stocks, loans from shareholders, convertible bonds, bonds with warrants and others. The cost of mezzanine maintenance do not exceed essentially the cost of equity, that's why it can reduce the weighted average cost of capital and, consequently, increase the value of the business.

Lots of private equity funds specialized in mezzanine financing all over the world, about 100 funds focus on European countries. European private equity funds mobilized capital in the amount of EUR 81 bn. over the past 10 years (SCM, 2013). So we can assume the existence of significant potential for financing large-scale PPP projects. In addition, recently IFIs and investment banks that specialize in Eastern Europe have been created mutually such funds. Last year, EBRD, EIB (European Investment Fund), Franklin Templeton Investments and other institutional investors, banks and private investors from Europe and the US launched a regional mezzanine fund Darby Converging Europe Fund III, the amount of which is EUR 250 mln. The Fund provides mezzanine finance in Central, Eastern and Southern Europe to support the local financial market, the introduction and implementation mezzanine financing tools, the development of corporate governance standards of investment companies.

In this discussion, the current situation has led to the emergence of new forms of financing in the capital market via non-bank financial institutions, such as unlisted infrastructure funds.

This relatively new player in the project finance market allows investors to have better access to a broad portfolio of infrastructure assets and allocate the risks among others. Such infrastructure funds have certain advantages over traditional investors. They have a low correlation to the market changes, low liquidity, at the same time they attractive in terms of profitability.

According to the Strategic capital management report, the share of unlisted infrastructure funds as a percentage of global infrastructure transaction volume was roughly 13%, i.e. in 2012 about US $120bn of capital was deployed by institutional investors through unlisted infrastructure funds managed by specialist infrastructure investment firms (SCM, 2013).

Thus, this form of innovative financing will develop and amount of infrastructure investments will increase due to the constantly increasing investment needs in significant investment to fund new or existing PPP projects. The first major regional private

infrastructure fund recently was created by Macquarie Renaissance with US $ 630 mln assets, focused on investment in infrastructure projects in Russia and other CIS countries. Among the major shareholders of the fund are the IFC, EBRD, the Eurasian Development Bank, Russian State Corporation "Bank for Development and Foreign Economic Affairs (Vnesheconombank)", Kazakh Kazyna Capital Management, Macquarie Capital Group and Renaissance Capital. In addition, Merrill Lynch also created the infrastructure fund that focuses on investments in Russia infrastructure - Merrill Lynch Russian Infrastructure Basket – with capital of US $500 mln. Earlier, several funds specialized in investment in the infrastructure and logistics of emerging markets was established, namely Ukraine, Russia, Turkey, CIS countries and Southern Europe.

Despite the increasing of the number of market participants and the amount of infrastructure investments in the emerging market regions, the number and volume of transactions are still low. The problem is a low attractiveness for new entrants to the industry and lack of incentive for the additional cash flows. The mezzanine investments and capital investments are very small in the emerging market regions, and venture capital investment is almost absent. There is very limited participation of domestic institutional investors both private and public funds. In addition, the domestic bond markets are underdeveloped and volatile.

4. Investment barriers and policy action to promote long-term investment

Institutional investors can play a more active role in infrastructure projects financing. But they didn't very active in PPP investment. According to S&P, institutional investors sourced about 18% of (only) global project finance in 2012, this compared to 63% by banks and 10% by governments (S&P, 2013). It has been estimated that less than 1% of pension funds worldwide are invested in infrastructure projects, excluding indirect investment in infrastructure via the equity of listed utility companies and infrastructure companies (OECD, 2011).

There are many different obstacles to institutional investors' participation in the financing of PPP projects, the main ones are listed in Table 2.

Table 2

The obstacles to institutional investors' participation in the financing of PPP projects

Aspect	Obstacles
Government support	- Lack of regulatory base for the long term investments; - Regulatory instability, political risks; - High cost of trading in the procurement of PPP; - Inefficient guarantee system for PPP projects; - Poor policy about infrastructure needs
Investors possibilities	- Lack of experience; - Insufficient scale of domestic investors; - Regulatory restrictions; - Short-term oriented investors
Investment climate	- PPP assets are perceived in the market as too risky; - The market fragmentation; - Underdeveloped financial market and its instruments; - Imperfect tools of risk management and guarantees; - Non-transparency in the infrastructure sector; - Lack of data of PPP projects; - Interests dissonance between PPP project partners.

Therefore, the removing of such obstacles is possible due to implementation transparent, clear and long-term management and organization of PPP sector. Significant investment will be made solely if investors can earn sufficient income adjusted for risk, and if there are appropriate conditions of access to capital.

In sum, attracting of institutional investment in the PPP and ensuring sustainable success in the long-term investments are solid base for overcoming several obstacles. Project bonds are different from other assets, their issue requires detailed data and risks assessment due to high advanced cost, lack of liquidity and long-term nature of PPP assets, so it is additional cost, which usually lacks most investors.

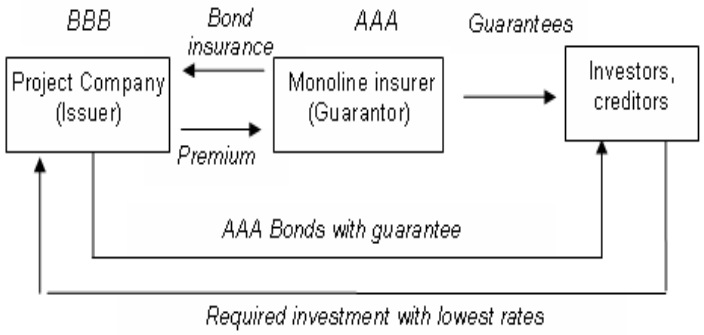
Really essential problems for the most potential issuers from emerging markets are entering into international markets and getting the high rating. Prior to 2008, there was an active bond market for international PPP projects. These bonds benefitted from a guarantee, or 'wrap', provided by monoline credit insurers. The financial institutions were guarantors for Project Company that issued bonds and in that way was created 'wrapped bonds' (Figure 5) In addition,

the bonds got higher investment grade due to guarantor and its excellent reputation that helped to sold securities profitably. Thus, investors could rely upon the credit rating of monoline insurer due to its guarantees to return investment in full. However, the crises had led to reducing in such operations and de-escalating of monolines activity in project finance market. Hence, investors ceased investing in large-scale projects via project bonds.

In this discussion, it should be noted some advantages of wrapped bonds. This financial tool attracts investors due to suitable conditions, risk transference to insurer, unaffected credit history and creditworthiness, ensuring bond sale, decreasing securities volatility and increasing their liquidity.

Figure 5

Traditional scheme of project bond insurance



Source: author's view

In this case government's support is apparently necessary, because it may raise the credit quality of project bonds, i.e. the credit rating of senior debt. Also government can adopt the 'monoline model' with special state development bank or fund. In this way, PPP projects will be more likely to attract the required financial resources in both domestic and foreign capital markets. According to 'Freshfields' research, which was mainly based on attitude of experts from leading infrastructure companies in the world after the introduction of 'Project bonds Initiative' in the European Union, mostly half of investors interpret bond rating 'BBB' as sufficiently attractive investment. (Freshfields, 2013). Also the S&P rated the majority of PPP projects (54%) as investment grade 'BBB-' and above (S&P, 2012).

It should be noted that the bonds payments and collateral are the most appealing factors that determine their credit rating. In world practice there are different ways to enforce project bonds, including letter of credit, provision formation, state or municipal guarantee, risks insurance, pledge of receivables, interest in the secured property and property security rights, etc. (App. A).

Based on these data we can conclude that almost all countries that use project bonds, provide tax allowance to the Project Companies and government guarantees to borrowers for mobilizing financial resources. Also, almost all countries have common insurance as the way to ensure project bonds and risk reduction, thus enhancing the investment grade of the project.

5. Conclusion

Our empirical evidence put forward the idea that the implementation and development of project bonds and mezzanine financing instruments in the emerging markets, including Ukraine, will lead to the emergence of new high-quality form of financing and financial instruments and expand the range of potential investors, which greatly simplify the process of attracting investments in PPP projects. Therefore, government should take adequate measures to promote long-term investment for great effect. Thus, it will generate a chain reaction: development of institutional investors will activate the stock market, and accelerate the development of public-private partnership and sustain economic growth.

Appendix A
Table A1

The features of project bonds in international practice

Country	Name of the financial tool	Issuer	Tax allowance	Tool of security			
				Pledge of receivables	State guarantee	Assigned receivables	Insurance
Canada	Project bond	Project Company	+	+	+	-	+
USA	Project bond secured by incomes; bond with general liabilities	Project Company, Government / Municipality	+	-	+	-	+
United Kingdom	Project bond	Government / Municipality	-	+	+	+	+
France	Project bond	Government / Project Company	+	+	+	+	+
India	Project bond	Government / Municipality	+	-	+	-	-
Chili	Infrastructure bond	Project Company	+	-	+	-	+
Kazakhstan	Infrastructure bond	Government / Project Company	+	-	+	-	-
Kenya	Infrastructure bond	Project Company	+	-	+	-	+

Source: Partnerships British Columbia; Ministry of finance of India; HM Treasury; Deloitte; Farquharson, Torres de Mastle and Yescombe (2011); Inderst (2013)

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ESTIMATE OF THE LEVEL OF PENSIONS AND INCOME REPLACEMENT RATES IN TERMS OF THE LONGEVITY RISK

Mariana POPA, PhD*

Abstract

Ensuring the incomes required at the retirement age, in order to ensure an optimal income replacement rate after the active period, represents an issue of utmost importance because the pension systems are underlying the social security of the population, they interact and have implications at the macroeconomic level in that they influence and they are influenced by the labor market, by the capital market, the level of GDP, the unemployment rate, the inflation rate and the budget balance. The longevity risk is a concern of the providers of annuities (pensions), the increase thereof being the consequence of improvement of the average life expectancy of the people that reached retirement age. A global concern is that improvement of life expectancy at the standard retirement age is not properly considered when estimating the level of the annuities (pensions) which will be obtained after retirement. In the analysis performed i estimated the income replacement rates at standard retirement age taking into account the main demographic and financial parameters that will influence the level of pensions in Romania. The conclusions highlight the issues to which the Romanian pension system will have to find solutions.

Keywords: personal income, wealth distribution, portfolio choice; investment decisions, non-bank financial institutions; financial instruments; institutional investors, demographic trends, macroeconomic effects, and forecasts, retirement; retirement policies

JEL Classification: D31, G11, G23, J11, J26

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1. The macroeconomic impact of the implementation of the private pension system in Romania

Starting with 2007, Romania begin to reform the pension system, therefore, together with the public pension system there was also implemented the private pension system Pillar II and Pillar III. Currently, in Romania operates a multi-pillar pension system that was implemented following the World Bank model. Thus, besides the public pension system (Pillar I), it was also implemented the private pension system (mandatory-Pillar II and voluntary-pillar III). The public pension system is a DB-type (defined benefits) and its risks belong to the state. The private pension system (Pillar II and III) is a DC-type (defined contributions) and the risks belong to the pension fund participants. The contributions to the voluntary private pension system (Pillar III) are made voluntarily, directly by the people with income and/or by their employers. Within the private pension system, the state's role is limited to financing (only Pillar II), regulation, supervision, control, protection of the rights of participants and beneficiaries, as well as promotion of financial education.

In Romania, because the contributions to the mandatory private pension system (Pillar II) are received by transfer from the public pension system (Pillar I) that leads to the fact that the longevity risk (for the part of old-age pensions which is transferred from the public pension system – Pillar I to the mandatory private pension system - Pillar II) **is transferred from the whole active population towards participants in the mandatory pension system (Pillar II).**

In order to determine the degree of aging of the population, in **Table 1**, i presented the evolution of the population by age groups (from 0-14 years old and over 64 years old) and its ratio to the total number of inhabitants and active population. As it can be seen from the data presented, the population aged over 64 years old has increased, within the period from 1990 to 2013, from 2,414 thousand people to 5,410 thousand people. This increase is due on the one hand to the increase of life expectancy, and on the other hand to the structure of the generations that were born more than 64 years ago. The population aged over 64 years old has increased both in numbers as well as in percentage compared to the total number of inhabitants and the active population. This increase is due to the

process of population aging, to the increase of life expectancy respectively.

Table 1

Population ageing

Year	Population aged over 64 years old (thousands of persons)	Population aged over 64 years related to		Population aged between 0-14 years (thousands of persons)	Population aged between 0-14 years old related to	
		the number of inhabitants (%)	the active population (%)		the number of inhabitants (%)	the active population (%)
1990	2,414	10.4	15.8	5,469	23.6	35.7
1991	2,479	10.7	16.1	5,329	23.0	34.7
1992	2,533	11.1	16.7	5,102	22.4	33.7
1993	2,595	11.4	17.1	4,947	21.7	32.5
1994	2,656	11.7	17.4	4,802	21.1	31.4
1995	2,721	12.0	17.8	4,644	20.5	30.3
1996	2,769	12.2	18.0	4,500	19.9	29.3
1997	2,832	12.6	18.5	4,376	19.4	28.5
1998	2,884	12.8	18.8	4,300	19.1	28.1
1999	2,928	13.0	19.1	4,215	18.8	27.5
2000	2,985	13.3	19.4	4,098	18.3	26.7
2001	3,054	13.6	19.9	3,985	17.8	25.9
2002	3,061	14.0	20.5	3,779	17.3	25.3
2003	3,108	14.3	20.6	3,530	16.2	23.4
2004	3,150	14.5	21.0	3,501	16.2	23.3
2005	3,191	14.8	21.2	3,373	15.6	22.4
2006	3,188	14.8	21.2	3,335	15.5	22.1
2007	3,199	14.9	21.3	3,289	15.3	21.9
2008	3,198	14.9	21.3	3,265	15.2	21.7
2009	3,204	14.8	21.3	3,246	15.1	21.6
2013[1]	5,410	27.07	58.79	5,372	26.9	53.4

Source: INSE, Romanian Statistical Yearbooks for years 1991-2014.

[1] *Provisional data, Romanian Statistical Yearbook 2014*

In Romania, the total number of inhabitants has decreased, within the period from 1990 to 2013, from 23,207 thousand to 19,984 thousand, such being a consequence of decrease of the birth rates. The increase of the population older than 64 years old has determined an increase of the dependency ratio, by the fact that in 2013 an active population of 9,202 thousand people is required to support an inactive population consisting of 5,410 thousand people aged over 64 years old and 5,372 thousand of children. In 2013, according to the provisional data provided by INSE, the population older than 64 years old reached a number of up to 5,410 thousand people resulting in an increase of its share by 27.7% compared to the total number of inhabitants and by 58.79% compared to the active population. Also, as mentioned, the increase of the number of people aged over 64 years old and the decrease of the active population are reflected in the state social insurance budget and they have as consequence budget deficits. The pensions provided by the public pension system are correlated to the pension point value. From a theoretical point of view, the pension point value represents a percentage of the Average Gross Salary of Economy (AGSE). From a declarative point of view, the pension point value is correlated to the AGSE. However, the pension point value is, in reality, subject to the political decisions, in what concerns the moment when this correlation with the AGSE is done.

2. The main demographic and financial parameters that will influence the level of private pensions in Romania

The amount of the lifelong annuity (pension) to which a participant will be eligible after retirement depends on seven key parameters: three exogenous parameters to the system and four endogenous parameters to the system.

2.1. Exogenous parameters of the pension system

a) The mortality rate of the participants to the pension fund

The mortality rate is the ratio between the number of deaths recorded within one year and the number of the exposed population, within that period, to the risk of death depending on age and gender. The mortality rate for the disabled population is higher than the mortality rate for the active population. The mortality rate depends on age, gender, exposure to risks. The mortality rate determines the life

expectancy, respectively the average number of years that an x-aged man or a y-aged woman will live. The longevity of a population is measured by the life expectancy at birth, respectively the average number of years that a newborn will live for. **For the pension providers, the relevant index for calculating the annuities is the life expectancy at the standard retirement age.**

The evolution of life expectancy varies from one country to another, because it depends on the economic situation, on the level of medical services, as well as on other economic and social parameters. There are separate mortality tables for men and women, for employees who perform intellectual labor and employees who perform physical labor, but also for the fit participants and the disabled participants. The distinction between the mortality rates of men and women as well as between that of the fit and disabled participants is obvious. The distinction between the mortality rates of the intellectual workers and those who perform physical work is less obvious. There is also an example of the "income effect", according to which higher improvements of the mortality rates were observed among the wealthier people. According to the statistics, the phenomenon of decrease of the mortality rates takes place in Romania with greater intensity, since 1990.

In Romania the difference in the mortality rates between the genders is also added the difference in the mortality rates due to the environment where the person has a permanent residence established (urban or rural areas). Thus, the mortality rate for the urban areas is different from the one for the rural areas. In the rural areas, the mortality rate is higher. According to the data from the Romanian Statistical Yearbook 2014, the average life expectancy at birth for men was of 71.24 years in 2013 (70.19 years in the rural areas and 72.07 years in the urban areas), for women it was of 78.28 years (77.69 years in the rural areas and 78.72 years in urban areas). The decline of the mortality rate was not equal for every age. For ages under 40 years old the decrease of the mortality rate was higher than for ages over 40 years old due to the longer period lived with a higher life quality (better nutrition, better medical care). The discrepancy between the mortality rate in the urban areas and the the rural areas is a major challenge for the pension funds. The substantial difference between the mortality rates of the two areas (rural and urban) - expressed by the difference in life expectancy between this two areas - leads to the inevitable conclusion that the private

pensions for contributors of this two areas should be calculated differently. **Thus, for the same amount of money accumulated in their personal account at standard retirement age and transferred to the annuities provider, the participant from the rural areas should receive a higher pension than the participant from the urban areas because their life expectancy is lower than the latter's and, therefore, the equal amount transferred must finance their pension for a shorter period of time.**

The European Union – for reasons of abolishing the gender discrimination - is seeking ways to remove from the calculation of the annuities (pensions) the use of different mortality tables for men and women (see European Council Directive 2004/113/EC implementing the principle of equal treatment between men and women in the access to and supply of goods and services), although from a statistical point of view it is proven the fact that there is a difference, in all the countries, for all the ages, between the mortality rates of women and the mortality rates of men.

In a society with a high mobility of labor, the calculation of an annuity (pension) based on the mortality tables suitable to the work environment (urban, rural) is complex. This calculation requires a rigorous analysis of the participants' activity before and after the standard retirement age (SRA). *If the calculation of the sole amount paid to the SRA for a life annuity will not consider the discrepancy between the mortality rates in the urban areas and in the rural areas, the pension providers as entities paying the annuities will prefer to attract retirees from the rural areas.*

The mandatory pension funds in Romania accumulate rights to an old-age pension only for active population on the labor market. The inactive population (unemployed, housewives, women on childcare leave) does not accumulate pension rights in the mandatory private pension system and, frequently, either into voluntary system.

If the annuities provider will be an insurance company, the risk of mortality due to the work environment (urban, rural), to profession, to gender is assumed by this company, and if the annuities provider will be a pension fund, then all the insured members of this fund (both those exposed to the high mortality rate, as well as those exposed to a low mortality rate) assumes this risk. Assuming that the investment risks of the pension funds are equal, a member will prefer to transfer

their net assets before retirement to a pension fund whose members (participants) belong to the populations with higher the mortality rates.

Adaptation of the mortality tables to future changes of life expectancy in Romania. The forecasts for future improvements in survival rates can be done either equally for all ages, either differently for every generation, the latter being considered the most appropriate. As the studies on building a suitable model for predicting the improvements of the mortality rates of the Romanian population are in the early stages, and Romania's integration in the EU will lead to an approximation of the mortality rates of the Romanian population with the mortality rates of populations of the other Member States (especially those in Western Europe where the mortality rate is already substantially lower), I have performed the calculations based on mortality rates of the active population (estimated mortality tables).

Estimation of mortality tables was performed by gender and the year of birth, for the active population employed in Romania, in two stages as follows:

- ***Stage 1*** **–Evaluation of the active population mortality rates in Romania for 2009**

Thus, I assumed that in 2009 the mortality rate for the employed active population was of 75% of the mortality rates of the Romanian population. Based on this assumption I calculated the mortality rates table for the active population in Romania for 2009. The mortality rate of the active population q_x^a in 2009 is equal to 75% of the mortality rate of the entire population of Romania, urban and rural, cumulated according to the data published by the INSE in the Statistical Yearbook of Romania from 2010. Where,

$q_{x, y} = d_{x, y} / l_{x, y}$

$q^a_{x, y} = 0.75 * q_{x, y}$

$q_{x, y}$ **-** the mortality rate,

$d_{x, y}$ - the number of men / women aged x, y years old deceased in year 2009,

$l_{x, y}$ - the number of men / women aged x, y years old alive on December 12, 2008.

- ***Stage 2*** **– Future improvements in mortality rates**

As of 2009 we have predicted that the mortality rates in Romania, for the active population will decrease (see formula no. 1).

Formula no. 1. [2]

$$q_{x,t} = 1 - \left(1 - q_{x+t-1}\right)^{0.99^t}$$

where:

q - the mortality rate

q_x - the probability that a man aged x years old will not be alive at age of x+t years old;

q_y - the probability that a woman aged y years old will not be alive at age of y+t;

t - the time elapsed from the year when the mortality rates were measured until the year to which we refer.

In Romania for year 2009, t = 0, and for year 2010, t = 1.

Based on formula no. 1, we calculated the mortality rate depending on the year of birth and gender. According to the estimated mortality rates for the employed active population in Romania, for year 2009, calculated for ages between 20 and 65, it resulted the fact that the mortality rates tend to decline; more people from the current and future generations will survive as opposed those from the generations that have already joined the private pension system and they will receive a pension from it. **The current and future generations will expose the pension providers to a higher risk of longevity due to the decrease of the mortality rates and to the increase of life expectancy.**

The longevity risk represents the risk that the providers of annuities (pensions) would pay life annuities for a period of time much longer that the one predicted by the actuarial calculations at the time of opening the pension right, due to the *inadequate estimates of the increase of life expectancy at the SRA.*

Table 2 presents the life expectancy, at the standard retirement age (SRA), of the active population based on own calculations and on heterogeneous population based on the data

[2] *Browers, N., Gerber, H., Hickman, J., Jones, D., Nesbitt, C.*

provided by INSE, for 2009. Life expectancy is the average length of life of an individual at a given age (x,y).

Table 2

Life expectancy at standard retirement age in Romania (years)

Current age - year 2009- (years)	***Life expectancy at the current age,* in 2009, calculated according to INSE's data for heterogeneous population (years)**		***Life expectancy at SRA* calculated according to INSE's data for heterogeneous population (years)**		***Life expectancy at the current age,* in 2009, for active population – own calculations (years)**		***Life expectancy at SRA* for active population –own calculations (years)**	
	Men	**Women**	**Men aged 65**	**Women aged 65**	**Men**	**Women**	**Men aged 65**	**Women aged 65**
20	68.8	75.9	77.5	79.7	77.9	83.8	84.5	86.4
25	69.0	76.0	77.5	79.7	77.4	83.4	84.0	86.1
30	69.3	76.1	77.5	79.7	77.0	82.9	83.6	85.6
35	69.6	76.3	77.5	79.7	76.7	82.6	83.2	85.2
40	70.1	76.5	77.5	79.7	76.5	82.4	82.7	84.9
45	71.0	76.9	77.5	79.7	76.7	82.1	82.3	84.4
50	72.1	77.4	77.5	79.7	77.1	82.1	81.9	84.0
55	73.6	78.1	77.5	79.7	78.0	82.3	81.4	83.6
60	75.4	79.0	77.5	79.7	79.1	82.6	81.0	83.2
63	76.7	80.0	77.5	79.7	80.0	83.0	80.8	83.0
65	77.5	80.1	77.5	0.0	80.6	83.2	80.6	0.0

Source: own calculations based on INSE's data.

Based on the data from the Romanian Statistical Yearbook for 2009, we calculated **(table 2)** the life expectancy at the current age and the life expectancy at the SRA for a man aged x years old, in 2009, and a woman aged y years old, in 2009, based on the following formula:

Formula no. 2.

$$e_x = x + \sum_{t=1}^{\infty} t \frac{l_{x+t}}{l_x} * q_{x+t} + 0,5 \quad (**_3$$

e_x – The life expectancy at age x (y) or the average lifespan of an individual from a certain x/y age.

The calculations performed show that the heterogeneous population at the SRA will have a life expectancy as follows: men aged 65 at the SRA have a life expectancy of 77.5 years; women aged 63 at the SRA have a life expectancy of 79.7 years and women aged 60 at the SRA have a life expectancy of 79.0 years.

If we consider the same mortality tables (afferent for year 2009) for the entire heterogeneous population, then the life expectancy remains equal at the SRA, both for men and for women. In general, the life expectancy of the active population is higher than the life expectancy of the heterogeneous population, both at the current age as well as at the SRA. If the mortality rates (and thus the mortality tables) will evolve exponentially, then life expectancy at the SRA for the active population will increase from 77.5 years old to 80.6 years old for men age 65 in 2009, and for men age 20, in 2009, life expectancy will increase from 68.8 years old in 2009 to 84.5 years old at the SRA.

Life expectancy at the SRA is calculated based on the current age, respectively on the year of birth, which differs from one age to another. The lower the current age, the higher the life expectancy at the SRA. In conclusion, the probability of staying alive until the standard retirement age and of benefiting from the pension increases as the year of birth increases. Several persons from the future generations, in comparison to the generations that have joined so far to the new pension system will remain alive to receive an old-age pension. Also, current cohorts as well as the future cohorts will expose the pension providers to the longevity risk given the decrease of the mortality rate, respectively the increase of life expectancy for each cohort.

b) The level of growth of the gross salaries / incomes depending on age and gender

[3] *** Developed formula see Browers, N., Gerber, H., Hickman, J., Jones, D., Nesbitt, C.*

In Romania, since the contributions to the public pension system and to the mandatory and voluntary pension funds are a share from the gross income/salary, any financial forecast on the benefits to be obtained from the pension system must be based on an assumption regarding the development in time of the income / salary of the participants to the system. The estimation of the level of pension to be received by the pension participants at the standard retirement age, as well as the social implications depend on the evolution of the gross salary income, because almost the entire participation to the pension system is represented by the active employed and paid population. The gross salary income is obtained as a result of a number of parameters, part of them being interdependent.

The parameters that can determine the gross salary income are: the age, the gender, the work seniority, the region of residence, the professional training, the level of education, the unemployment rate, the inflation rate. The evolution of the wage is also specific to the branch of activity, and the increase of the personnel's salaries is due to the specialization, the gained experience, to seniority, to the level of education, etc. Also, the unemployment rate in the region where the activity is performed influences the evolution of the gross revenue / salary. The revenues of the independent workers depend on average on the situation of the national economy. There is a correlation of these obtained revenues with the average increase in the GDP. According to the data from the Romanian Statistical Yearbook 2010, for the evolution in time of salaries, we took into account the average gross salary equal to 1,906 RON for men and the average gross salary equal to 1,775 RON for women. In order to calculate the wages based on age, gender and the average wage we used our own formula (no. 3). Note that age is correlated with the work seniority.

Formula no. 3. (own formula)

$$S(V) = \begin{cases} V^{\alpha}, \ 20 \leq V \leq 40, \ \alpha > 1 \\ (V-40)^{\beta} + 40^{\alpha}, \ V > 40, \ 1 > \beta \end{cases}$$

S (V) - Wage at age V;

V – age;

40 – is the approximate age when the function is changing direction;

α, β – the coefficients set according to the average salary, the branch of activity, the professional training etc. The wage increases exponentially due to the employee's professional specialization, to seniority and to the increase of the GDP. Given the variation in time of personal remuneration depending on gender, we calculated the pensions that will be obtained at the SRA using my own calculation formula (no. 4).

Formula no. 4

S(V)= V^{λ} **+ Const 1 >** λ

C – constant (minimum salary)

For the calculations i assumed the variation in time of the personal gross salary and of the average gross salary per economy (AGSE) as a result of real growth in the GDP by 4%. In 2009, the average gross salary was of 1,845 RON. The average gross salary earned takes into consideration only the employees who have worked continuously up to the SRA, full time.

c) The tax treatment applied to the private pension system

The tax treatment applied to the private pension system (mandatory and voluntary) is of the EET type (Exempt, Exempt, Tax), respectively exempt contributions, exempt investments, taxed pensions. The regulations regarding the taxation applicable to the pensions in Romania can be found in the Fiscal Code.

2.2 Endogenous parameters of the pension system

a) The Standard Retirement Age (SRA)

Within this analysis, the standard retirement age (SRA) for the age limit is 65 years old for men and 63 years old for women and it represents the age established in the public pension system, according to the provisions of Law no. 263/2010 as subsequently amended and complemented. The more the retirement age is higher than the standard retirement age: i) the period of accumulation of personal assets to the pension fund is extended, ii) the period of payment of pension decreases.

b) The level of contributions paid to the pension system

During the period of accumulation, the amounts from contributions truly grow, due to the increase of the gross salary/revenues, which in turn grow based on the real growth of the economy and of the workforce productivity. In conclusion, the

increase of the contributions accumulated in the personal account is exponential and it fluctuates differently depending on the base percentage to which the percentage point is added.

c) The return on investment of pension fund

The return on investment taken into account is the real annual investment return. The return on investment has the greatest impact on the amounts accumulated in account of the pension fund until the retirement date and implicitly on the level of the pension. **The most important factor in the accumulation of the amounts, and in determining the level of the pension for the age limit, is the percentage of the return on investment obtained during the accumulation period**. The accumulated amount in the account/net asset of the pension fund to which the participant has adhered is due to the investment return if after 35 years of contributions, for a constant level of contributions, given that the salaries do not increase, a real annual investment yield of 3 %, 4% and 5% is obtained. The impact of the investment return on the net assets accumulated at the SRA is more consistent than the impact of increase of the contributions to the pension fund. The increase or the decrease of the investment yield by one percentage point influences the net assets already accumulated plus the assets to be accumulated in the future from the future contributions of the participants, while the increase or the decrease of the contributions to the pension fund influences only the assets that will accumulate in future from contributions.

d) Management fees and costs

The management fees and costs of a pension fund differ from Pillar II to Pillar III and they include, in general, management fees, trading fees, audit fees, storage fees. The management fees of the private pension funds have two main components: a percentage from the gross contribution and a percentage from net assets accumulated in the fund according to the legal provisions.

The estimates of the level of pensions and of the income replacement rates at the retirement age were based on the following assumptions:

- The improvements of mortality rates and life expectancy after the SRA;

- The Standard Retirement Age (SRA): 65 years old for men and 63 years old for women;
- The uninterrupted period of contributions since 2009 until the SRA;
- Average annual real growth of 4% and 5% of the Gross Domestic Product (GDP) and of the Average Gross Salary of Economy (AGSE);
- Annual real growth of the public pensions of 4% and 5% due to the increase by the same percentage of the gross salaries (income) of the employed population;
- Average annual real growth of 3%, 4% and 5% of pensions from Pillar II and Pillar III as a result of the increase by the same percentage of the return on investment;
- The return of investment predicted to be obtained from investing the money is of 3%, 4% and 5%;
- The gross salary/income of the workers will fluctuate over time depending on gender and the salary variation, according to own calculations performed. We also assumed that the gross salary(incomes) are equal to the gross average salary for those who were, in 2009, aged 40. In 2009, the general Average Gross Salary of Economy was of 1,845 RON. The Average Gross Salary of Economy was 1,906 RON for men and the one for women was 1,775 RON;
- The contribution to the public pension system for year 2009, for normal working conditions;
- The value of the pension point for year 2009. In 2009, the pension point value for the public pension system was 38.8% from the Average Gross Salary of Economy;
- The taxation of pensions was according to the provisions of the Romanian Fiscal Code.

Within the analysis performed, the income replacement rate is the ratio between the first pension for the age limit obtained immediately after retirement (usually at the standard retirement age) and the last salary/income before the standard retirement age.

The results obtained reveal the following aspects:

a) the impact of the population aging process-, through the future effects of life expectancy improvements, increase of the mortality rates and, implicitly, of increase of the longevity risk

that -will influence the level of pensions and, consequently, the population's income replacement rates at the SRA;

b) the major influence relationship of the macroeconomic elements (the evolution of the GDP, the evolution of the Average Gross Salary of Economy, the pension point value, the taxation of the gross salary /income, the taxation of pensions), of the exogenous parameters and of the endogenous parameters of the pension system will determine the amount of the pensions that will be received by the participants to the pension system at the standard retirement age;

c) the inefficiency of the pension system (public and private) in Romania, to replace the population's income during the active period with income from pensions, as was evidentioate by the net / gross income replacement rate;

d) the income replacement rates differs between ages and genders;

e) the income replacement rates is differentiated between genders according to: the average gross salary, the standard retirement age and the life expectancy;

f) there are differences between the level of the pensions obtained from Pillar II and those obtained from Pillar III, both until the standard retirement age (different investment returns and different management fees), as well as after the standard retirement age (different investment risks, different administration fees and exposure to mortality risk);

g) the existence in Romania of three important factors that will decide the development of the voluntary pension system:
- the deductibility ceiling for contributions to the system;
- the involvement of the employers to ensure decent pensions for the employees;
- the insurance for the risk of disability and death by entering such in the pension schemes offered by the voluntary pension funds (for example, *disability pensions before the SRA and survivors' pensions in case of death before and after the SRA*). Currently these risks are not covered by the mandatory private pension funds and, partly, neither by the public pension system.

h) if the pension point value is linked to the Average Gross Salary of Economy (AGSE), the net replacement rate at the

SRA that can be offered by public pension system together with the private pension system (mandatory and voluntary) will vary in optimal conditions (annual investment yield of 4%, annual increase of the AGSE of 4%) between 77.2% and 41.2% for men aged 20-65 years old in 2009 and for women between 67.3% and 44.2% for the same conditions (table 3).

Table 3

Net replacement rate at SRA for Pillar I+II+III (pension point value correlated to AGSE)

Age in year 2009	Male SRA=65						Female SRA=63					
	a[4]=4%	a=4%	a=4%	a=5%	a=5%	a=5%	a=4%	a=4%	a=4%	a=5%	a=5%	a=5%
	b[5]=3%	b=4%	b=5%	b=3%	b=4%	b=5%	b=3%	b=4%	b=5%	b=3%	b=4%	b=5%
20	66.1	77.2	92.4	68.9	68.4	80.3	62.6	67.3	79.7	54.0	61.4	71.3
25	65.4	75.5	88.9	68.5	67.5	78.3	61.8	65.1	76.0	53.2	60.0	68.9
30	64.7	73.6	85.1	68.0	66.6	76.1	60.8	62.5	71.8	52.2	58.2	66.0
35	62.5	70.0	79.5	65.9	64.2	72.2	59.3	59.3	66.8	50.6	55.9	62.3
40	60.2	66.3	73.7	63.5	61.6	68.0	57.2	55.3	61.2	48.6	52.8	58.0
45	57.2	61.8	67.3	60.2	58.3	63.2	54.7	50.9	55.1	46.0	49.3	53.1
50	60.2	63.4	67.1	62.8	61.0	64.4	60.3	63.2	66.5	59.4	62.0	65.1
55	57.0	59.3	61.9	60.2	58.5	60.9	55.0	56.7	58.5	54.6	56.2	57.9
60	50.2	51.2	52.4	52.1	51.0	52.1	49.2	49.8	50.5	49.1	49.7	50.4
SRA	41.2	41.2	41.2	41.2	41.2	41.2	44.2	44.2	44.2	44.2	44.2	44.2

Source: own calculations based on INSE's data

i) **if the value of the pension point will be correlated to inflation rate** according to Law. 263/2010, **the net replacement rate at the SRA** that can be offered by the public pension system together with the private pension system (mandatory and voluntary) **will vary in optimal conditions** (annual investment yield of 4%, annual increase of 4% of the AGSE) **between 55.0% and 41.2% for men**

[4] *It represents the annual average growth rate of Average Gross Salary of Economy (AGSE) until the standard retirement age (RSA)*
[5] *It represents the annual investment return of the pension fund*

aged 20-65 years old in 2009, and between 44.0% and 44.2% for women for the same conditions (table 4).

Table 4

Net replacement rate at SRA for Pillar I+II+III (pension point value correlated to inflation rate according to Law no. 263/2010)

Age in year 2009	Male SRA=65						Female SRA=63					
	a=4 %	a=4 %	a=4 %	a=5 %	a=5 %	a=5 %	a=4 %	a=4 %	a=4 %	a=5 %	a=5 %	a=5 %
	b=3 %	b=4 %	b=5 %	b=3 %	b=4 %	b=5 %	b=3 %	b=4 %	b=5 %	b=3 %	b=4 %	b=5 %
20	43.9	55.0	70.1	45.1	44.7	56.6	39.3	44.0	56.5	29.0	36.5	46.4
25	44.8	54.8	68.2	46.2	45.2	56.0	40.5	43.7	54.6	29.9	36.7	45.6
30	46.0	55.0	66.5	47.5	46.1	55.6	41.8	43.5	52.8	31.1	37.2	44.9
35	46.4	54.0	63.4	47.8	46.1	54.1	43.3	43.3	50.8	32.4	37.7	44.2
40	47.6	53.7	61.1	48.5	46.6	53.1	45.5	43.6	49.5	34.1	38.4	43.5
45	49.1	53.7	59.2	49.3	47.4	52.3	48.2	44.4	48.6	36.5	39.8	43.6
50	49.2	52.5	56.2	49.5	47.7	51.1	50.6	53.4	56.7	47.4	50.1	53.2
55	50.4	52.8	55.4	52.1	50.3	52.8	49.6	51.2	53.0	47.8	49.3	51.0
60	47.2	48.3	49.5	48.3	47.2	48.3	47.7	48.3	49.0	47.0	47.6	48.3
SRA	41.2	41.2	41.2	41.2	41.2	41.2	44.2	44.2	44.2	44.2	44.2	44.2

Source: own calculations based on INSE's data

3. Conclusions

- In order to provide adequate pensions at the SRA, uninterrupted contribution to all the pension systems is required, with amounts as large as possible and for periods of time as long as possible, so that sufficient assets can accumulate as to cover the needs upon retirement.
- The pension funds and the annuity providers must manage and cover their longevity risk through:
  - internal risk management procedures (actuarial methods for estimating the improvements of the mortality rates and life expectancy);

– outsourcing the risk management towards insurance and reinsurance companies;
– outsourcing the risk management towards the capital market (assurance of financial instruments for the longevity risk: longevity swaps, longevity bonds or other types of derivatives).

- Information and awareness of the fact that the level and the length of the contributions to the pension systems will influence the pensions income at the SRA and the improvements to life expectancy and the increase of the number of pensioners due to the retiring of the baby-boom generation will result in the decrease of the GDP and of the investment profitability.
- The public pension system will have **sustainability** problems because the payment of the pensions is not correlated with the increase of life expectancy, and the current value of future pension payments cannot be estimated because there is no direct correlation between the contributions made to the system and the future pension payments. To these problems are also added those regarding the generation of those born during the "baby booms" period, an aspect that will determine the increase of the public expenses of pension payments. In addition, the public system will have problems also **solvency problems**. The risk of contributors to the public pension system refers to its sustainability and solvency, but these risks are transferred to the Romanian state.
- The private pension system will have problems in terms of **adequacy** because, since they are not guaranteed, the level of the pensions at the SRA does not provide an adequate standard of living. In Romania it is very important the content of the law that will regulate the payment of private pensions and there must take into account the longevity risk as well as an effective asset allocation based on the life cycle of the participants to the system so that it can provide adequate benefits to SRA. The risk of the private pension system (Pillar II and III) related to offering the adequacy of the incomes upon retirement belong to the participants to the system.
- The improvements of average life expectancy and mortality rates can create serious problems for the pension funds and for the annuity providers. The mandatory private pension system (Pillar II) is exposed to the longevity risk because it is a DC type system with guarantees: the pension schemes guarantee the level of the paid contributions minus the management fees. Management company of

the pension fund promised to pay pension benefits (contributions paid minus the legal costs and transfer penalties) according to the prospectuses of the pension schemes and they are required to establish provisions with the purpose for fulfilling this future payment obligation. The amount of the provisions after the SRA will be calculated based on two main factors: the return on investments and the length of period for which the annuities (pensions) will be paid. As regard to pension payment period, an important role is played by the estimates of the mortality rates which will determine the level and length of the future payments until the death of the pensioners. The return on investments can be negatively influenced by the process of population aging and, therefore, should be imposed the estimation of the impact of increase of increasing life expectancy on the solvency of the pension fund that a participant has joined. Although there isn't yet a law on payment of private pensions in Romania, this risk exists and it should be taken into account when drafting the legislation for the payment of pensions, because the estimation of the mortality rates, when calculating the pension at the SRA and the obligations of the pension fund, will have an essential role in the living standards after the SRA.

- The Romanian contributors to the mandatory private system (P2) will become aware of the longevity risk when they will realize that, at the retirement age, for the same accumulated amount they will receive different pensions depending on the year of birth, gender, their areas (rural, urban). Meanwhile, the public system (Pillar I) – from which were drown contributions to Pillar II - will calculate pensions without any direct reference to the year of birth. As a consequence, there is a growing public interest regarding the division of the longevity risk and the limitation thereof.
- Even after reforming the public pension, the income net replacement rate after the SRA will not be able to achieve the target set to offer a net pension equal to 60% -70% of the last salary earned before retirement. Therefore, the pension received after the SRA will not provide a necessary income for a decent standard of living.
- As regard the need to save for the retirement age, along with supporting the development of the private pension systems, the financial education has an essential role in voluntary saving for providing the necessary financial resources for old age and informing on the risk of not having an adequate income for a decent life at the retirement age.

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ARE PENSION SCHEMES DISCRIMINATORY IN EU MEMBER STATES?

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Abstract

The purpose of the paper is that of highlighting the most relevant features of direct and indirect gender discrimination and age discrimination, in the statutory and occupational old-age pension systems. The aim is to offer a contribution to the reflection on the effectiveness of gender and age equality legislation in the field of old-age pensions.

Keywords: age discriminations, gender discriminations, Romania

JEL Classification: H55, J32

Introduction

Occupational schemes are deeply involved in the processes of reforming old-age pensions and are increasingly run according to insurance principles and thus under the criteria of capitalization: this might give rise to many gaps in terms of social protection, especially when non-standard working patterns, mainly taken up by women, are concerned.

Gender Discriminations

Comparing old-age pension models in the perspective of gender equality: the traditional Three-Pillar Model vis-à-vis the World Bank Model

The traditional Three-Pillar Model, upon which EU Directives 79/7/EEC and 2006/54/EC are based, is made up of a statutory public pillar, an occupational pillar and a private insurance pillar. The countries which are organized according to this pillar are: Cyprus, Denmark, Finland, France, Greece, Luxembourg, Malta, Norway,

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Portugal, Turkey, Sweden, Ireland, Austria, the Netherlands, Belgium, the UK, Liechtenstein, Italy, Spain, Germany, and the Czech Republic[1].

The choice of the Three-Pillar Model per se is irrelevant as far as gender equality is concerned. Indeed, what do matter are rather the features of the various schemes, statutory and occupational, used in the Three-Pillar Model. This especially in relation to the different working patterns of men and women in the labour market and to the pay gap that exists between them that are both mirrored by the pension system.

Many Central and Eastern European Countries have chosen, on the other hand, the World Bank Model (WBM) rather than the Three-Pillar Model. The WBM is made up of the following pillars: a first mandatory public pillar; a second privately managed mandatory savings pillar; a third pillar made up of additional private pensions savings and occupational pensions, which has been used in order to better represent the latest pension reforms. The WBM Countries are: Bulgaria, Lithuania, Estonia, Latvia, Slovakia, Croatia, Slovenia, Poland, Hungary, FYR of Macedonia, Romania and Iceland[2].

In particular, there was a paradigmatic shift in many Central and Eastern European countries after the collapse of communism, when the strong idea of redistribution and the egalitarian attitude of the pension system turned into pension self-care via privately managed pension funds. Within this process, the original statutory system was generally transformed into a three-pillar model with the co-operation of the World Bank (and of the International Monetary Fund)[3].

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[1] *Although some literature classifies the Czech Republic as a WBM system (see H. Vaandrager, 'Adopting a regional approach to occupational pensions in Central and Eastern Europe', AEGON Global Pension (2009)), the national expert defines it as a Three-Pillar Model system.*

[2] *Although attention is regularly given to the Central and Eastern European countries when we are discussing the WBM, according to its definition the pension system of Iceland belongs to this group as well. In this case the first pillar is a tax-financed public plan, which provides for a flat rate or means-tested basic pension for all; the second pillar is a mandatory occupational or private, but publicly regulated, funded pension scheme; the third pillar is a voluntary funded pension scheme.*

[3] *See also Alfio Cerami: Social Policy in Central and Eastern Europe, Universität Potsdam, Lit and Peter Vanhuysse: Devide and Pacify, CEU Press.*

According to the national reports, the WBM pillar system per se may be useful for gender equality purposes, provided that the mainly indirectly discriminatory features within each system are abolished by taking into account the real situation of women in the labour market. The most significant problem of this system is that it often transfers the differences between the wages of women and men to the pensions.

Employees in low-paid and precarious jobs, among whom women are disproportionately over-represented, cannot afford to save much and often fail to do so even if the law has supposedly made retirement savings schemes mandatory. For most of them the voluntary private pillar is practically useless.

Advantages reserved for women with regard to child care, a lower retirement age and service period requirements are rooted in the previous pension system, where these preferences served as balancing elements for women's pension rights. After the change of regimes, many countries recognized that these factors result in negative effects as well.

The main difference between the Three-Pillar Model and the WBM rests in the second pillar, which is occupational, in the one model, and privately managed, mandatory and financed by a share of social security contributions, in the other. Here the main doubt as regards gender equality legislation based on the three-pillar model is whether the privately managed and publicly financed, mandatory WBM schemes can be classified as a second tier of the first pillar and so included under Directive 79/7/EEC, or as private insurances consequently regulated by Directive 2004/113/EC.

General trends: old-age pension reforms and their impact on gender equality - WBM Countries

Countries of the WBM have to face similar demographic and structural problems as the nations with the Three-Pillar Model, such as the ageing population, changing family patterns, the lowering of the fertility rate and financial sustainability.

Moreover, besides the classic and well-known factors, the effects of the current financial crisis have to be managed as well. We can see that in this difficult economic situation old-age pension reforms give priority to financial aspects rather than to gender equality, and women are quite vulnerable because they are more

dependent on the statutory system (this happens, for example, in Iceland, Slovenia, and Lithuania).

The national systems' answer to maintaining the balance between ageing and financial sustainability is to regularly increase the retirement age (Estonia, Hungary, Romania, FYR of Macedonia, and Latvia from 2012, for example). Even though the increase in the pensionable age is not as yet linked to equalization, as most of the WBM Countries still maintain differences in the age of retirement for men and women.

Another feature, which is common in the Three-Pillar Model Countries, is the shift from DB to DC/NDC schemes (see Appendix) and, more generally, the strengthening of the link between pension benefits and contributions (Slovenia, Bulgaria, and Romania). Slovenia is a case in point: as from 2015, the contributions paid by the insured person to the first pillar will be recorded in his/her personal pension savings account; personal pension savings accounts shall be virtual, because the system will maintain its PAYG nature and the contributions of active workers will still be used to pay the pension of retired workers. In this context, it is considered necessary to introduce a strong redistributive element (the zero pillar), which would provide everyone with a universal pension at 65 years of age.

All the WBM countries, however, have realized the shift to DC schemes by introducing the privately managed, mandatory second pillar/second level of the first pillar schemes: it is important to stress that the significance of the new schemes will definitely increase in the forthcoming years, as the WBM system was introduced around the new millennium and the first payments are only now being made.

We can also witness an increase in the required minimum contribution periods (for example, in Romania and Slovakia) and higher contribution levels (FYR of Macedonia, for instance); there is also a general decrease in the replacement rate between wages and pensions.

The pension calculation based on lifelong earnings rather than on the last working years or on the best selected year of employment has been introduced (Bulgaria, Romania), like in many Three-Pillars Model countries. Although disparities in the labour market are not eliminated at the stage of accumulating pension assets, pension systems tend to compensate them at the time of calculating the benefits. This is probably the case as regards the non-

application of different life expectancy factors in the first-pillar statutory schemes. In Poland, for example, the application of uniform life expectancy rates will increase benefits for women at the expenses of men. On the other hand, the application of gender-related actuarial factors is very much debated in relation to the second pillar/second tier schemes.

Age Discriminations

As I previous mentioned there are more criteria of discrimination that gender, one of there is age.

Currently pension schemes are covered by the Equal Treatment Directive 2006/54/EC (available in all EU member states) which basically makes it unlawful to discriminate against employees because of their age.

The law covers all types and all aspects of occupational pension schemes and applies to active members, deferred members and pensioners. Personal and stakeholder pension schemes are affected but only by reference to the employer contributions made on behalf of employees.

This means employee contributions to a group personal pension or stakeholder scheme may vary according to age but employers should avoid 'indirect discrimination'. For example, it is unlikely to be appropriate for employers to prescribe different rates of employee contribution at different ages to qualify for the same employer contribution, unless the difference can be objectively justified.

The law does not cover the state pension, National Insurance rebates into contracted out schemes, pension sharing on divorce or annuities purchased from insurance companies.

Employment Retirement Ages

In almost all member states, employers are no longer able to force employees to retire at any age unless the retirement can be objectively justified. Employers can have their own non-statutory retirement ages – referred to as an Employer Justified Retirement Age (EJRA) – but these must be objectively justified.

The previous Regulations allowed employers to set a default retirement age (DRA) which allowed them to force employees to stop working at age 65 or higher. Now that the DRA has disappeared and more people work past age 65, employers will have to decide what

pension scheme benefits they want/have to provide for those working on. We may see more employers consulting with their legal and pension advisers on flexible retirement options under their rules to cater for this.

Pension Scheme Retirement Ages

A default retirement age at which employers could force their employees to stop working is different from a 'normal retirement age' in a pension scheme, which is the age when members can normally take pension benefits without needing employers' or scheme trustees' consent. Or simply, the age at which employers expects the majority of their workforce to retire. The Business Innovation and Skills department has confirmed that "...the removal of the DRA does not affect occupational pension schemes. The absence of a DRA does not affect the setting of a 'normal retirement age' or 'normal pension age' for the purposes of occupational pension schemes."

However, employers will have to consider allowing continued accrual of benefits past the normal retirement age. For Defined Benefit schemes, this might be in addition to or instead of existing provisions that actuarially increase benefits on late retirement. In addition, for group personal pensions and stakeholder schemes, an employer probably has to contribute to such schemes for as long as the employee works for them – their contributions cannot stop at the normal pension age set on the policy if the employee continues to work past that normal pension age, unless once again there is objective justification.

Insured Benefits (Non-Pensions)

The Government in almost all EU member state did take account of submissions to consultation regarding insured benefits (income protection, life assurance, sickness insurance, accident insurance, private medical cover) where it's been argued that if no age restriction was to apply to these benefits, the cost of cover for employers would rise considerably. In such cases, employers might cease to offer such benefits to all staff regardless of age. Because of this, the government has introduced an exception to the principle of equal treatment on the grounds of age for group risk insured benefits provided by employers. This means that employers can still apply age restrictions to such schemes.

Objectively Justified

An objective justification allows an employer to set requirements that are discriminatory. The direct/indirect discrimination must pursue a legitimate aim, such as business needs and efficiency, health and safety reasons and particular training requirements. Each case will be considered on its merits and appropriate evidence will need to be provided to support the objectively justified claim. For example, if the aim is to encourage staff loyalty, then there should be evidence to show that the discrimination is actually doing it. Any employer seeking to use 'objective justification' should consider taking advice from an expert in employment law, as well as appropriate ongoing actuarial and pensions advice. In practice, for all but the largest employers, the cost of this will often outweigh any benefits.

Exemptions

Unless there is a specific exemption under the law, age discrimination will only be lawful if it can be objectively justified as outlined above.

Three important exemptions for money purchase schemes (occupational and personal and stakeholder) are as follows:

• Age-related contributions are allowable – provided the aim is to yield equal emerging benefits or to make 'more nearly equal' the benefit.

• Earnings-related contributions are allowable – despite any inequality which might arise due to the fact that older workers tend to earn more.

• Equal rates of contributions to money purchase schemes, irrespective of age, are allowable despite any inequality in the emerging benefits.

However, if the employer goes ahead with the four bands without drawing up projections that confirm:

• broadly similar emerging benefits and/or

• without obtaining actuarial evidence that this contribution structure is aiming to provide an equal or more nearly equal benefit, they lay themselves open to possible future challenge by an employee.

Some other age-related provisions that remain Permissible Under The Equal Treatment Directive 2006/54/Ec For Occupational Pension Schemes Are:

• Minimum and maximum ages for admission to a scheme.

• Age criteria in actuarial calculations, for example, to take account of early and late retirement.

• Reduction in a spouse's pension on the basis of a difference in age between the member and the spouse.

Automatic Enrolment

Some employers will currently have more than one pension scheme in place for (some of) its employees and automatic enrolment will probably lead to many additional employers having different schemes for different sections of their workforce. The employer will need to be mindful of both direct and indirect age discrimination and, as long as the legislation is not breached, there is no requirement to put all staff into the same scheme.

Pension System In Romania

The entire pension system in Romania has undergone significant changes over the last decade. The three-pillar model set up as the basis of the system currently represents all of reforms structurally linked to pensions. During the past five years there has been an analysis of the viability of the pension system, with the accent being placed on the public pension system.

Despite the Government's ambitious objectives relating to the reform of the social security field, unfortunately this analysis did not seem to point to a consistent and coherent reform pattern and was not able to offer a solution to the demographic decline and the lack of any solution to address the increase in the amount of pensions. The number of legal changes adopted over the last decade is significantly high[4], thereby contributing to the increasing hesitation in clarifying the legal provisions relating to the pension system and leading to confusion among an entire segment of the population, i.e., pensioners. Consequently, the reforms undertaken in the pension field, even if they have not so far targeted the fundamental principle of the equity of the system, will be continued and taken to their

[4] There are 38 laws, 40 governmental ordinances, 51 governmental decisions and 32 other types of legal norms such as instructions by the Minister of Labour.

conclusion in order to assess the viability of the pension system and to take the changes to the next level.

The Romanian pensions system, as set up by the existing legal framework, contains a mandatory funded scheme under Pillar II[5]. Pillar II includes privately managed obligatory pensions. The mechanism for these pensions consists of reducing the individual contribution rate and transferring the resulting amounts to the privately managed pension funds.

Summary

In all member states it is obvious that women pensioners run higher poverty risks than men as a consequence of the inequalities existing between men and women in the labour market. These differences in work patterns are then mirrored, often in the form of indirect gender discrimination, by the pension schemes. All the more so when: the pension system is based on the lifetime employment record of the claimants; the schemes are based on actuarial principles (which means the use of gender-related actuarial factors); there is a strong link between benefits and contributions (such as there is in the defined contributions schemes, for example); benefits are earnings related.

This is a complex area and employers, trustees and advisers should be fully aware of the age and gender equality legislation and the objectively justified rules and the exemptions that apply. Advisers can provide very important guidance for employers and trustees by checking that existing schemes satisfy the law and by recommending appropriate structures for new schemes that are fully compliant as well as meeting the needs of the employer and its workforce.

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[5] *The mandatory funded scheme is addressed by Law No. 411 of 2004 as modified and completed by Law No. 23 of 2007.*

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Appendix

Technical concepts

The Pay-as-you-go schemes (PAYG) are those where the payment of contributions by the pensioners are relevant for qualifying conditions and pension amount purposes, but pensions are then actually paid out of the contributions by active workers.

The funded schemes provide for pensions paid by the contributions accumulated over the years by the pensioners themselves, according to the criterion of capitalization.

Schemes with defined contributions (DC) are those in which the total amount of the pension is not predetermined, but depends upon factors such as the number of contributions accumulated or the results of the management of the resources set aside by means of periodical contributions; contributions to these schemes are, on the other hand, predetermined.

The notional defined contribution schemes (NDC) give participants a hypothetical account containing all contributions made over their working lives, credited at a certain rate of return; at the time of retirement, pension benefits are calculated taking into consideration the contributions accumulated in the notional account and the life expectancy factor.

Schemes with defined benefits (DB) are those where the intended total pension payment is established a priori: for this prearranged total the contribution is periodically adjusted according to factors such as the variations in the general economic situation, the variations in the profits of the investments of capital made by the fund and so forth.

Pensionable income is the wages upon which the pension amount is calculated. Career/contribution/insurance periods for the purpose of pension calculation are normally the number of yearly wages/contributions or insurance years upon which pensions are calculated.

Pensionable age is synonymous with the age of retirement that is the age at which a pension can be claimed.

Minimum qualifying conditions are those requirements which have been set for access to pension rights. Among them the following may be relevant: the service/career periods, that is the total length of employment; the insurance period, that is the number of the

claimant's insured years; the contributions period, that is the number of contributions paid into the pension fund.

Coefficient of transformation can be used in pension calculation to represent the average remaining life expectancy of the claimant.

Figurative/notional contributions, which are also called contribution credits, are contributions virtually but not effectively paid by the insured person: contribution crediting is generally recognized in cases of unemployment, sickness, caring periods, and so forth; normally, in this case contributions are paid out of the State budget.

Full pension is the maximum amount of pension which is payable.

The replacement rate between wages and pensions is the difference which exists in the individual wages and pension amount.

PUBLIC BANKS IN UKRAINE: SUPPORTS AND CHALLENGES

Nataliia VERSAL, PhD*

Abstract

This paper investigates the effect of private and public ownership in banking sector of Ukraine using data from 2005 to 2015 including periods of the rapid growth of banking sector - from 2005 to the Q4 2008, the fall due to the impact of the global financial crisis - Q4 2008 - Q3 2009, the slight, very volatile growth in the post-crisis period - 4Q 2009 - 4 Q 2013, the significant reduction for almost the entire 2014. Our results confirm the high trust of households in public banks during the crises due to solid confidence to government. The full compensation plays in this context only additional role. We calculate the most important financial soundness indicators for Ukrainian banks, such as loan-to-deposit ratio (LTD), equity multiplier, share of loan loss provisions (LLP) in loan portfolio, ROE and ROA and analyze them in dynamics. We find out that all the indicators are more volatile for public banks than for private banks. The LTD ratio in public banks in 'good' periods is less than in private banks and in 'bad' periods conversely. The Ukrainian public banks are overcapitalized after financial crisis 2008 - 2009. The LLP to loan portfolio ratio is much higher for public banks, especially after nationalization of troubled banks. Government as owner of troubled banks does not show quick positive results. Therefore, ROE and ROA for public banks are significantly lower in crises and slightly higher in stable periods, than for private banks. As a result, we cannot claim that public banks may effectively influence on soundness and development of Ukrainian banking system. It is necessary to provide a more in-depth research of this problem.

Keywords: financial intermediation; emerging markets; financial soundness; financial crisis.

JEL Classification: G18, G21, P34

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1. Introduction

Public banks (state-owned banks, government-owned banks) are an ambiguous phenomenon in the economy. Such controversy is due to the specific impact of public banks on the banking system development and economic growth that can be both positive and negative. Many researchers have proved this statement since origin and evolution of public banks. In fact, the research results provide two opposite sides of the public banks role in the economy.

In our view, this is not surprising, because the role of the state in the economy is often a controversial issue. However, researchers of the first direction or the 'development' view argue that public banks have a positive effect on economic growth: Andrianova, Demetriades, Shortland (2008), Karas, Schoors, Weill (2008). Many researchers frequently refer to the study of Gerschenkron (1962), one of the first studies that pointed to the special positive role of public banks for economic growth. Moreover, in this aspect, it should be taken into account the fact that the base of the positive evaluation of the public banks was the experience of the Russian Empire.

In this regard, we should mention the study of Bunge (1852), who not only proved the positive impact of public banks on economic development at all levels (from national to municipal), but implemented these ideas into practice as Finance Minister and created Peasants' Land and Noble' Land Banks in the 1883-1885.

Of course, after the October Revolution, the situation changed dramatically, and private banks ceased to function in the Soviet Union. Public banks became financial intermediaries who had only accumulated funds from the households and passed them to the government-owned companies, and of course, it was explicit proof of 'development' view, albeit in a non-market economy.

At the same time the complexity of public banks research is precisely the fact that the functioning of such types of banks in the Soviet Union can be considered from the point of 'political' view La Porta, Lopez-de-Silanes, Shleifer (2002). If we move from the macro to the micro level and focus on issues such as bank performance and efficiency, we are again faced to two different points of view.

So, Bonin, Hasan, Wachtel (2005) find out that the government-owned banks are less efficient than private banks and Altunbas, Evans, Molyneux (2001) point to the 'slight' benefits of

state-owned banks in this context. The consideration of this set of research has only reinforced the opinion that the study of this problem is at a crossroads.

We do not put an end to this discussion by our study, but we would like to show the peculiarities of the situation with the public banks in Ukraine, and in particular in the context of crises (2008 - 2009 - global financial crisis, 2014 - 2015 - war in Ukraine, economic decline, inflation). One of the theses of Andrianova, Demetriades, Shortland (2008) is the statement that government-owned banks are more attractive for depositors than private banks. Therefore, we would like to test this hypothesis on the example of public banks in Ukraine. We also would like to answer the question of whether the public banks could stimulate the development and at the same time provide the soundness of Ukrainian banking system.

2. Data and methodology

We also have to highlight the disclosure of the essence of separate indicators, which are used in the research. We determine a public bank as a bank, in which government owns 50 percent or more. Therefore, we choose the following variables for the analysis:

Deposits_total_PrB/Deposits_total_PB - the ratio of deposits in private banks (Deposits_total_PrB) to deposits in public banks (Deposits_total_PB);

Deposits_HH_PrB/Deposits_HH_PB - the ratio of household deposits in private banks to households deposits in public banks;

Deposits_HH_PrB/Deposits_HH_Oschadbank - the ratio of household deposits in private banks to households deposits in Oschadbank;

T_Deposits_HH_PB, T_Deposits Oschadbank, T_Deposits_HH_PrB – the growth rate of household deposits in public banks, Oschadbank, private banks;

LTD – the loan-to-deposit ratio. We calculate LTD for private (LTD_PrB) and public banks (LTD_PB), and LTD in foreign and domestic currencies from 2012 to show the dollarization level in banking sector;

EM - the equity multiplier is the way of examining how bank uses equity to finance its assets. We calculate equity as difference between assets and liabilities (EM_PB – equity multiplier for public banks, EM_PrB – equity multiplier for private banks). At the same time, we also use the indicators of stockholders' equity (EQS_PB,

EQS_PrB) and equity as difference between assets and liabilities (EQ_PB, EQ_PrB);

LLP/Loans – the LLP indicator shows the level of problematic loans. We calculate it as loan loss provisions to loans; FCA shows which part of the assets is in foreign currency (FCA_PB/Assets_PB, FCA_PrB/Assets_PrB);

ROE - return on equity measures a bank's profitability by revealing how much profit bank generates from each 1 unit of equity;

ROA - return on assets tells us how much profit bank generates for each 1 unit of assets.

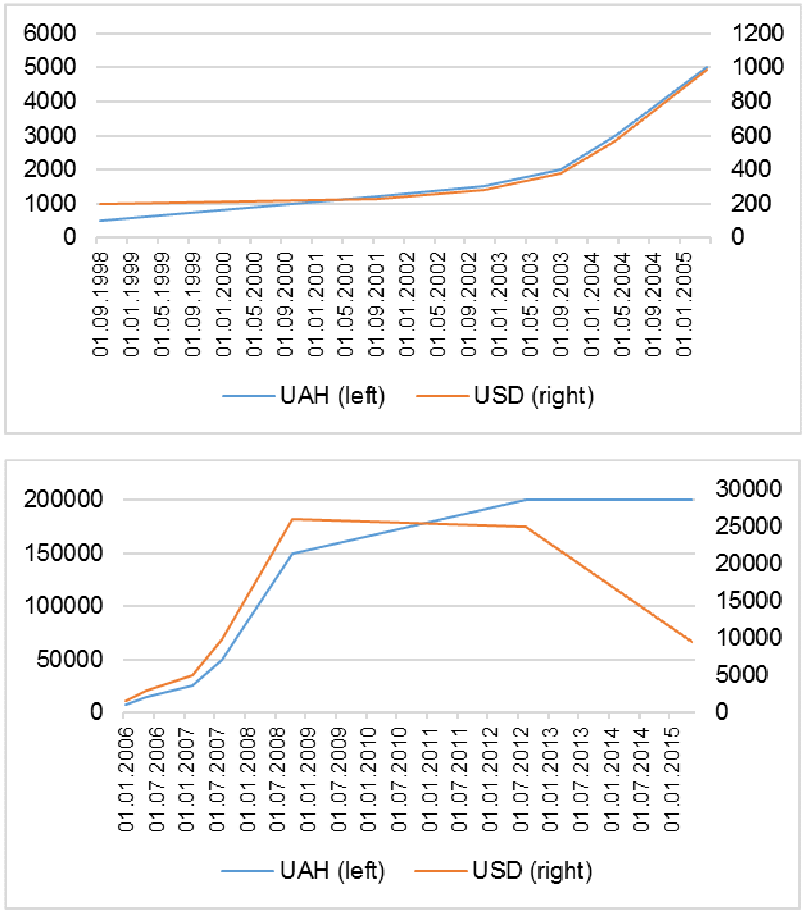
The research applied solely official data provided by the regulatory authorities on the base of financial statements of banks in Ukraine. We gathered and completed data quarterly from January 2005 to January 2015.

3. Are the public banks in Ukraine more attractive for the depositors than the private banks?

This question is quite complicated for Ukraine, and the roots of this should be sought in the recent past. After the collapse of the Soviet Union, Ukraine has started to form its own banking system. Public banks were the basis that eventually began to lose its leading position in Ukrainian banking system.

Especially painful was the question of non-repayment of deposits to the households from public savings bank - Oschadbank, as a result households deposits were impaired due to galloping inflation (in 1993 inflation in Ukraine amounted to more than 10,000%). Thus, households' confidence in the banking system was destroyed: government does not fulfill its obligations, so the private banks might do this too. To solve this problem, government decided to implement the system of guaranteeing deposits in 1998. This greatly improved the situation with confidence in the banking system. However, the rule has one exception - the Public Savings Bank 'Oschadbank' was not include in the Deposit Guarantee Fund, because its deposits are guaranteed in full amount by government. Other banks have a limit to the maximum amount of the deposit compensation (Figure 1).

Figure 1
Trends of bank deposits compensation limits in Ukraine during September 1998 –March 2015



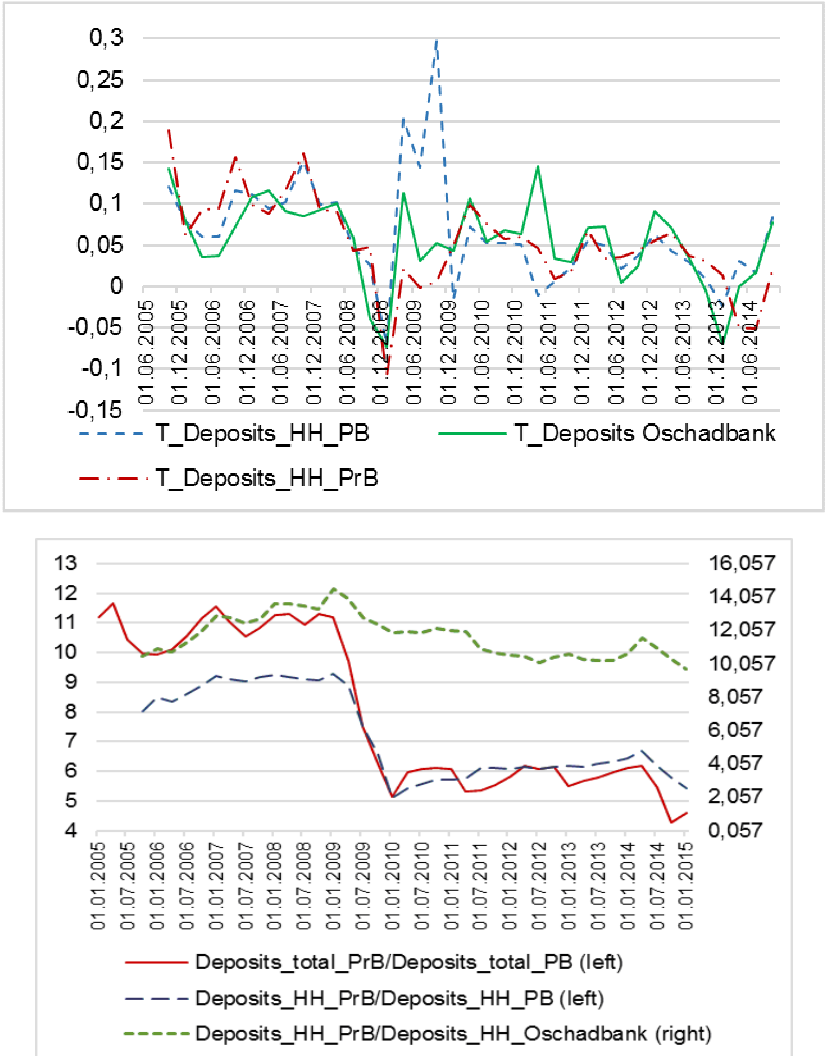
Source: Deposit Guarantee Fund of Ukraine

However, was this factor the crucial point of choosing the banks by households for placing deposits in Ukraine? To answer this question we consider indicators such as the ratio of deposits in private banks to deposits in public banks, the ratio of household deposits in private banks to household deposits in public banks, and the ratio of household deposits in key public bank in attracting

deposits from households (Oschadbank) to household deposits in private banks (Figure 2).

Figure 2

Trends of some deposit indicators, June 2005-December 2014



Source: author's calculation based on data from the National Bank of Ukraine

Thus, the analysis of Figure 2 allows us to emphasize several periods in the development of the situation in the market of households bank deposits: the rapid growth - from 2005 to the Q4

2008, the fall due to the impact of the global financial crisis - Q4 2008 - Q3 2009, the slight, very volatile growth in the post-crisis period - 4Q 2009 - 4 Q 2013, the significant reduction for almost the entire 2014. The conclusions that can be done in the context of our question are follows:

In the years of economic growth with a relatively stable banking system, private banks are more attractive than public banks due to the higher interest rates on deposits. Moreover, households prefer private banks for deposits placing despite the fact that Oschadbank guarantees to return the deposits in full, unlike private banks. In the post-crisis period, this situation repeats itself: the growth of stability in the banking system leads to the fact that households are again ready to take risks and place deposits in private banks. This conclusion is also confirmed by the high value of volatility for these indicators. Thus, the volatility of the ratio of deposits of private banks to the deposits of state banks is 2.5992.

Throughout the crisis, we can see completely different trends. At the same time, it is necessary to distinguish the difference between the crisis 2008 - 2009 and the crisis of 2014 - 2015. During both crises certainly was bank run, and money quickly ran from both public and private banks. Nevertheless, the first crisis showed households confidence in public banks, and it was indeed higher than in private banks. The situation has changed dramatically during the second crisis. We see the growing role of public banks compared with private banks in the deposit market (Figure 2). During the second crisis, we would like to draw attention to two points. First, more than 35 private banks went out from the banking market of Ukraine in 2014, so it has been reflected in the statistics of household deposits. Second, government recommended the state-owned enterprises, including the payroll segment for theirs employees, servicing in public banks, which of course greatly affected the results. If we remove these two factors, we might not get a significant strengthening of public banks in the deposit market as a whole and in the context of households deposit markets.

4. Can the public banks stimulate the development and provide the soundness of Ukrainian banking system?

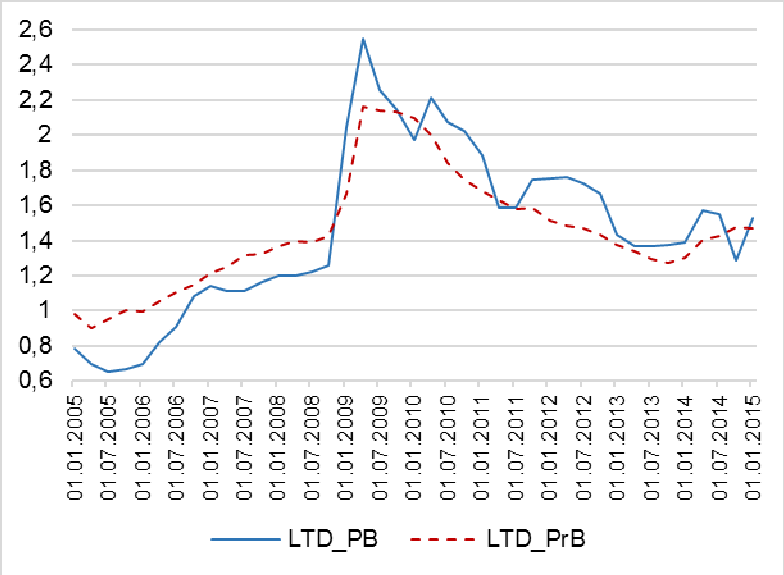
Today, the question of banking systems soundness arises more and more often, and we can find a variety of tools to assess this indicator. The Bank of International Settlements and the central banks

develop specific sustainability assessment indicators. We chose those indicators that are most painful for the Ukrainian banks: LTD, EM, LLP, ROE, ROA.

First, we analyse the dynamics of LTD ratio (Figure 3). Higher values of this indicator may identify liquidity problems in banks or possibility to banks to have funding sources other than deposits.

Figure 3

Trends of LTD indicators during January 2005 – January 2015



Source: author's calculation based on data from the National Bank of Ukraine

An analysis of the Figure 3 can be interpreted as follows:

Under conditions of economic growth in 2005 - end of 2008, the LTD growth rate was rather a positive than a negative thing. So, that time was characterized for Ukrainian banks as an access to the international capital markets, which contributed to economic growth. As we can see, private banks were more successful in that situation than public banks.

The growth of the LTD ratios is rather a negative point in the crisis-period. It could be explained by several factors in the crisis of 2008 - 2009: the outflow of deposits (the increase of liquidity

problems) and the high dollarization both loans and deposits (the devaluation of the national currency leads to the fact that the financial statements of banks are significantly distorted). Especially this growth is dangerous, if it is the result of a serious imbalance between foreign currency loans and deposits. Public banks showed stronger growth of this indicator than private banks due to the second factor. Volatility of LTD ratio is much higher for public banks - 0.4806, while for private banks is 0.3309.

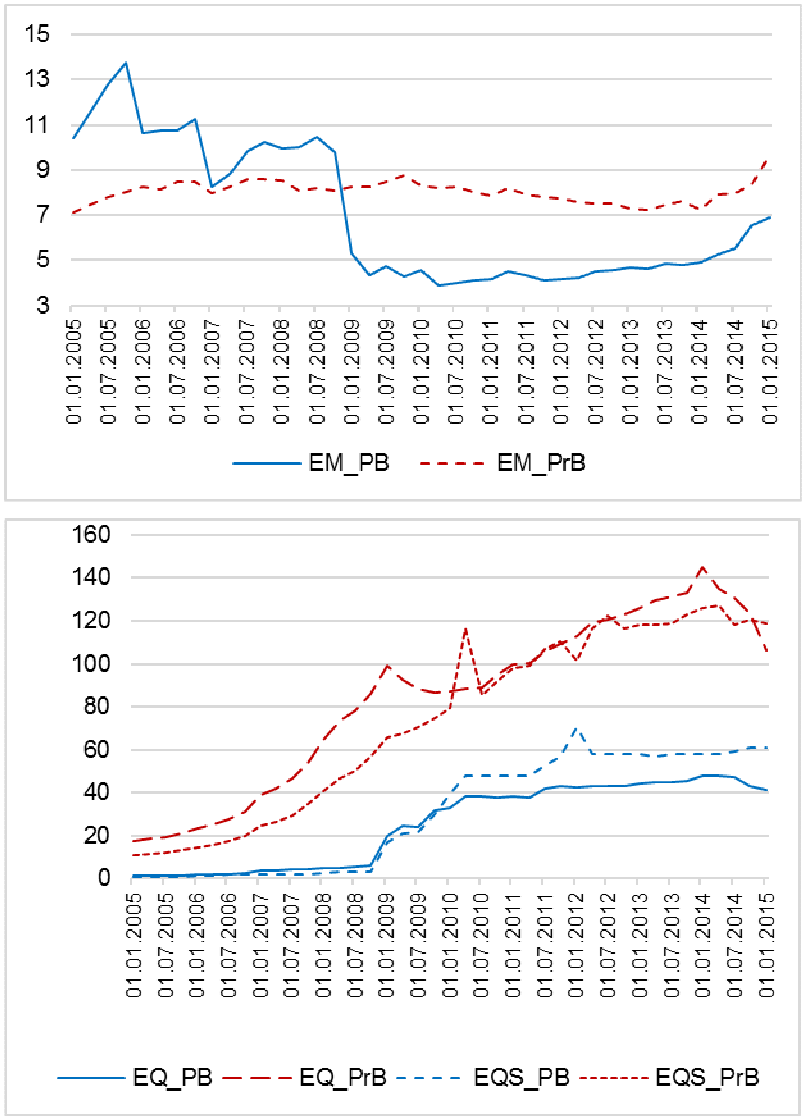
Second, the analysis of banks equity and equity multiplier shows the following (Figure 4):

Equity multiplier of public banks has dropped significantly due to the global financial crisis. On the one hand, it is positive, because before the crisis, it was possible to talk about the problems with the capitalization. However, the decline was so strong that it could cast doubt on the role of public banks as financial intermediaries. At the same time, the situation with equity multiplier in private banks was relatively stable, except the last crisis.

As for equity, we can see that the stockholders' equity usually grows in public banks, unlike private banks. It is natural because many private banks have been withdrawn from the market in a result of the two crises. Equity of public banks is recently lower than their stockholders' equity, which indicates the losses. The nationalization of three troubled banks after the crisis of 2008 - 2009 also explains this situation.

Figure 4

Trends of EM indicators, equity and stockholders' equity during January 2005 – January 2015, bln hryvnia

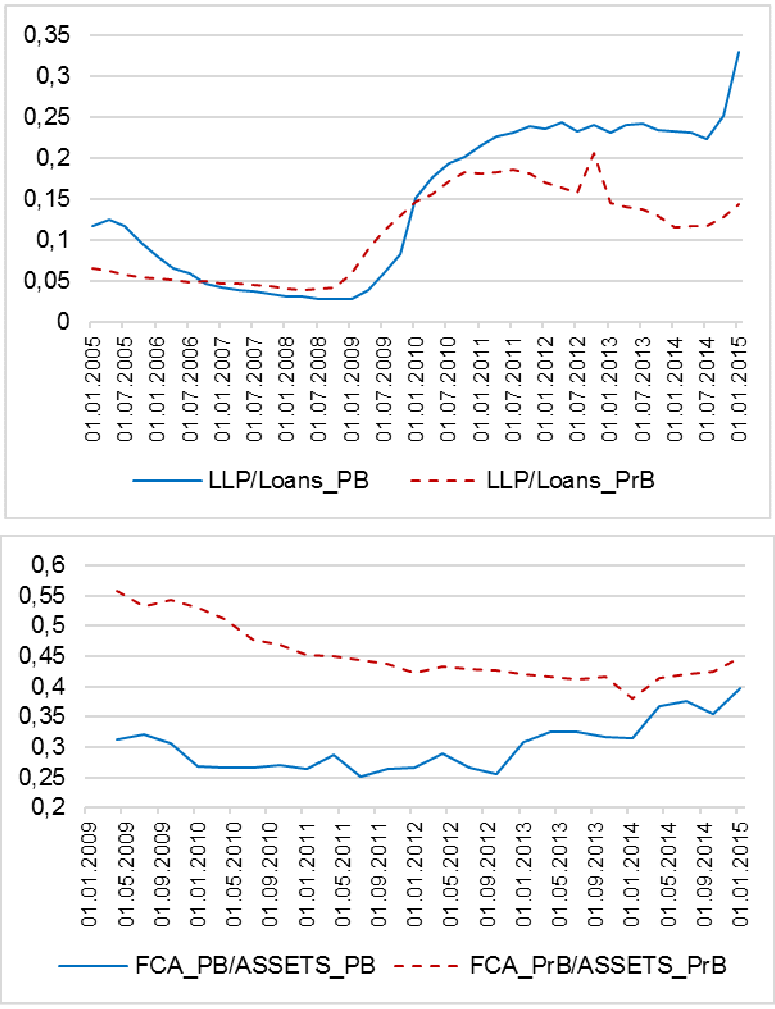


Source: author's calculation based on data from the National Bank of Ukraine

Third, analysis of the bank loan portfolio quality shows that public banks demonstrated a significant increase in the share of LLP in the loan portfolio (Figure 5).

Figure 5

Trends of LLP ratios during January 2005 – January 2015 and assets dollarization indicators during April 2009 – January 2015



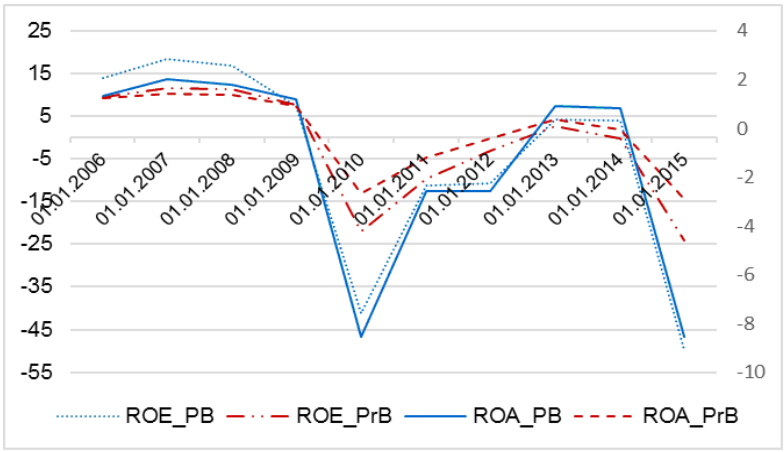
Source: author's calculation based on data from the National Bank of Ukraine

Such a strong growth of this indicator was due to several reasons: the first crisis - the nationalization of troubled banks in 2009 - 2010, the second crisis - the presence of significant amounts of foreign currency loans in loan portfolio. As for private banks, after a serious increase of the LLP share in the loan portfolio after the crisis, there was a decrease of this indicator due to sharp lending reducing by private banks, particularly retail loans were a cause of the formation of large provisions. In addition, after the collapse in 2008 - 2009, private banks have provided foreign currency loans very cautious.

Fourth, analysis of profitability indicators shows high volatility in these indicators for public banks (Figure 6). As we have already mentioned, after the first crisis this was due to the bank nationalization. In the second crisis, it can be explained by the noticeable deterioration in the quality of the loan portfolio of public banks and the losses of public bank branches in the occupied territories. We can explain such essential decrease of these indicators of public banks in comparison with private banks by the fast taking into liquidation of troubled banks. The losses of troubled banks were not into the general statistics of the banking system.

Figure 6

Trends of ROE, ROA indicators, January 2005 – January 2015, %



Source: author's calculation based on data from the National Bank of Ukraine

5. Conclusion

In sum, our study shows that, actually, households tend to trust more in public banks during the crisis, but in a stable situation will prefer private banks. Thus, we can conclude that the full compensation in situation of banks liquidation is not so important in choosing a bank for deposits placement depending on ownership an important role in choosing a bank depending on ownership, as the confidence in government as a solid player in banking market in crises. As for the influence of public banks on the soundness of the banking system and its development, we cannot give a definite answer to this question. The results of the analysis show that the public banks cannot be called the locomotive of development of the banking system as well as the soundest financial intermediaries, at least in the study period. In this regard, we consider it is necessary to conduct a more in-depth research of the previously mentioned problem.

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