FLUCTUATION IN PENSION FUND ASSETS PRIVATELY MANAGED UNDER THE INFLUENCE OF CERTAIN FACTORS. STATISTICAL STUDY IN ROMANIA

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On international level, the economic and financial crisis has determined a diminution of the asset value of compulsory pension funds, reflecting a reallocation of funds towards alternative or low-risk investments. The present paper indicates how the net asset value of privately managed pension funds in Romania may be affected or not by certain influence factors in direct correlation with different asset allocation strategies of pension funds. In this way, on literature review there are many studies which have analyzed the fluctuation of pension funds assets and a better reallocation of their investment in order to improve their efficiency. The experience of the value fluctuation of privately administered pension fund net assets is highly important, firstly beacause of its effects on the increase and the decrease of invested values for the insured persons' accounts, under the circumstances of constantly maintaining their contributions and, implicitly, the results achieved through these investments. The research methodology consists in testing of five variables: currency exchange rate, credit interest rate, bank deposit interest rate, reference interest rate and value of the stock exchange market index (BET-C index), by means of the multiple linear regression method. The conclusion is that only two of these factors, namely, the currency exchange rate and the reference interest rate, influence net asset value of privately managed pension funds, the second pillar, one in direct and the other in indirect correlation. In order to neutralize the effects generated by the diminution of the net asset value of privately managed pension funds, considering a short time horizon, we shall elaborate a dynamic mix of their investments able to adapt to the fluctuations of the influence factors. Thus, new opportunities will be generated in order to achieve the efficiency of pension funds and to prevent the diminution of the value of insured individuals' contributions to these pension funds.

Keywords: privately managed pensions, net assets, investments, factors of influence, statistical correlations

JEL Codes: G23, C15

1. Introduction

Internationally, there are systems of diversified pensions, which, in general, present a combination of the public and the private component. To the European Union level, there is no mutual system of pensions available for all Member States, but most of the Member States of the European Union have approached the multi-pillar pension system proposed by the World Bank.
In Romania, the pension system is, as well, structured according the pattern proposed by the World Bank, thus: ***-the public pension system***, which represents the ***first pillar***, monitored by the National House of Public Pensions – CNPP; ***-the private pension system***, under the observation of the Private Pension System Supervisory Commission – CSSPP, including its two components: the ***second pillar*** – *privately managed compulsory component*, introduced in May 2008.

According to the law, the designation of the pension fund includes the collocation *privately managed pension fund*; the ***third pillar*** – *privately managed optional component*, introduced in May 2007.
The compulsory component of private pensions, the second pillar, stirs up a series of discussions on international level, as, against the economic crisis background, certain States have no longer complied with the initial pension reform model, and we mention here countries in Central and Eastern Europe adopting certain adjustments of contributions to the pension second pillar.
Therefore, Hungary has adopted, at the end of 2010, a governmental plan for nationalization of compulsory private pension funds, the second pillar, meant to diminish the budgetary deficit. In 2009, Lithuania and Estonia have decreased the contributions to compulsory private pensions, from 5.5% to 3%, respectively, from 6% to 2%, and Latvia intends a decrease from 8% to 2%. In Slovakia, the second Pillar is no longer compulsory, and the contributions register a decrease of tow thirds. In order to reduce the budgetary deficit, Poland has announced at the beginning of April 2011 the diminution of the level of contributions transferred towards the second Pillar from 7.3% to 2.3%. Romania, as well, has not succeeded in following the legal provision stipulating an annual growth of 0.5 percentage points for contributions to the second pillar. This growth was achieved only for 2009, for 2010, the contribution remained to 2.5%, and for 2011, it has increased to 3%.
The representatives of the European Commission claim that, as the States have assumed the implementation of a certain pension reform model, they should maintain the adopted system, regardless the economic context.
Considering these current issues of the system of compulsory private pensions, numerous studies and analyses were elaborated taking into account the efficiency of investments performed, their guarantee and regulation schemes and other aspects.

2. Theoretical Basis

The economic financial crisis manifested on international level has considerably reduced the asset value of pension funds, all over the world. A study undertaken in 2010, by Towers Watson (1), considering the evolution of pension fund assets on the greatest markets of pension funds in the world, has revealed the fact that the main issues disturbing their activity, as a result of the financial crisis, remain: “liquidity; the management of credit/collateral risk; asset manager underperformance; and new challenges in strategic allocation” (Watson, 2010).
The role of private pensions has great importance, particularly “...in countries that have introduced a mandatory private pillar as part of a systemic pension reform” (Tapia, 2008). For preventing “market failure” and the diversification of fund asset investments in order to reduce their risks, for most of the pension systems, on international level, diverse alternatives are established according to Pension Benefit Guarantee Schemes, as “A pension guarantee fund cannot work properly *without* adequate funding rules.” (Stewart, 2007)
In Romania, the system of privately administered pensions, for each component of private pension funds, namely, the second pillar of compulsory private pensions and the third pillar of optional private pensions, there is a pension scheme enforced by the law which provides a broad series of “risk control instruments: active dissociation, actuarial reserves, verification through depository, guarantee fund, audit, minimum rate of profitability.” (Zavoianu, 2010).
The best practices for the management of pension fund investments reveals the fact that a strategic mix of asset investments, adjustable in time, considering the situational influence factors, offers opportunities for achieving the best results. Therefore, various studies on international level, concerned with diversified ways of allocating pension fund assets show that, on the main markets, “pension funds continued to diversify into alternative assets” (Watson, 2009). As well, the economic crisis effects have determined a reallocation of pension fund asset investments from the member countries OECD towards low risk investments mainly internally

oriented (Antolin and Stewart, 2009). Other countries have indicated that the appreciation of the currency exchange has determined an increase of the value of private pension fund assets (Watson, 2010).
Consequently, the insight of the value of pension fund assets becomes crucial as the diminution of their value influences, on one hand, their solvability and, on the other hand, the values accumulated in the accounts of insured individuals.
Considering numerous factors influencing private pension assets, as well as the unemployment rate, the evolution of the currency exchange rates and of the monetary policy interest rates (Mot, 2010), the present paper attempts at selecting few of them in order to determine how far they influence the net asset value of compulsory private pension funds, the second pillar.

3. Concepts and Methodology

In Romania, the system of privately administered pensions becomes a compulsory system for the individuals newly entered in the work market, below 35 years of age, and remains optional for the rest of the individuals aged under 45, who are already insured and contribute to the public pension system. The *administrators of privately administered pension funds* are represented by distinct companies, authorized by the supervisory body, the Private Pension System Supervisory Commission. The situation of authorized administrators of privately administered pension funds indicated 18 administrators at the initiation of the system (July 2007) and 14 at the end of the participant selection process (January 2008), presently, the system counts only 9 administrators (according to the last reports of CSSPP on January, 31st 2011). The *investments* deriving from the assets of these funds are controlled, monitored and undertaken according to the risk range specific to each fund, in an efficient and prudential manner. Except for one single pension fund administered by Generali, registering a high level of risk, the other 8 pension funds indicate an average level of risk.
In Romania, the main indices of privately administered pension funds, the second pillar, at the end of the year 2010, according to CSSPP reports, are as it follows (the indices are indicated by the Newssheet, CSSPP, 3rd year no 12/2010):
-the presence of 9 active pension funds, divided into two risk categories according to the investments performed: average risk funds (8 funds) and high risk funds (a single fund);
-the number of participants to privately administered pension funds is 5,186.37 thousand indicating an increase of 5.6% reported to the end of the year 2009 (December). From the total number of participants, 59% are aged under 35 (for this category, the adhesion is compulsory) and 41% are aged over 35 (for this group, the adhesion is optional). The coverage rate of number of participants in total employees of Romania reached 80% of the total number of employees (Newssheet, CSSPP, page 10);
-the involvement level related to the number of participants reached 67% for the first three privately administered pension funds, which belong to the following pension administrators: ING, Allianz-Țiriac şi Generali, and 81% for the first five pension funds;
-the net assets estimated to 1,010.9 million euros (4,331.9 million lei) registered an increase of almost 82% as compared to December 2009 and of 4.3% compared to the previous month;
-from the total of net assets of privately administered funds, 86.3% have been invested on national level, and the rest of 13.7%, abroad.
The evolution of net assets of privately administered pension funds during the entire period of their collection, since their settlement to the present, is illustrated in Figure no. 1, Annex no. 1.
The investments of net assets of privately administered pension funds, in Romania, on investment categories agreed by the law, are presented in Figure no 2, Annex no. 1, from what it can observe that, the investments of privately administered pension funds are mostly oriented towards *State bonds, shares and corporate bonds*, registering about 90% of their total.

We may notice a slightly gradual decrease of the active total value owned by bank deposits from the moment of the system settlement till present, namely, from 43.44% in June 2008, to 7.18% in December 2010.
Considering the structure of the privately administered pension fund investments, we will test the level to which **certain factors influence the evolution of the assets managed by privately administered pension funds, the second pillar.** Thus, we will mention certain factors of influence determining the evolution of privately administered pension fund assets:
-the level of interests, which may influence the transaction value of instruments with fixed income backward the evolution of interests. For the analysis, we consider the interest rates for credits and deposits, as well as the reference interest rate;
-the exchange rate, which influences the value of foreign currency denominated assets at the moment of their evaluation. Generally, a depreciation exchange rate of the national currency reported to the euro exchange rate determines a value increase of these assets;
-the stock market and its evolution influence, as well, the value of assets included by the pension funds. The value of investments in shares, for the second pillar, represented at the end of December 2010, 12.2% of the total of fund assets. The investments in shares rated on stock markets from the Member States of the European Union indicated 3.2% of the total of privately administered pension fund assets.
For the analysis, we use monthly data provided by the Private Pension System Supervisory Commission, the National Bank of Romania and Bucharest Stock Exchange, for the period May 2008 - December 2010 (the research is applied for a number of 32 monthly observations).
According to these factors of influence, the following variables have been applied for testing statistical correlations:
-the net asset of privately administered pension funds, as a dependent variable (its values during the studied period, May 2008 – December 2010, are outlined in Figure no 1, Annex no 1);
-the currency exchange lei/euro, the credit interest rate, the deposit interest rate, the reference interest rate and the value of the BET-C index, as independent variables (values which are pointed out in Figures no 3-7 from Annex no 1).

4. Results and discussions

The analysis of the correlation between the dependent variable and the five independent variables already identified may be achieved either separately, using the correlation coefficient, analyzing the correlations between the dependent variable and one independent variable selected among the group of studied variables, or globally, applying the linear regression.
Concerning the analysis of the correlation between the dependent variable, the value of the net asset of privately administered pension funds, the second pillar, and independent variables: the currency exchange lei/euro, the credit interest rate, the deposit interest rate, the reference interest rate and the value of the BET-C index, the Table no 1, Annex no 2, illustrates for each regression model the value of the correlation coefficient (R), the value of the determination report (R Square) and the standard error.
As we may notice in table no 1, Annex no 2, the first independent variable introduced in the model is “reference interest rate”, which exercises the greatest influence over the value of the net asset of the pension second pillar. The second stage introduces the second independent variable, namely “the currency exchange lei/euro”. The value of the correlation coefficient “R” is significant, which implies the presence of a very strong correlation according to the model.
Model no 1 presents the reliance between “net assets of privately administered pension funds” and the “reference interest rate”, achieving a correlation coefficient of 0.950 and a determination report of 0.903, which suggests the existence of a correlation between the two variables, highly important due to the fact that 90.3% of the fluctuation of “net assets of privately administered pension funds” is determined by the modification of the “reference interest rate”.

Model no 2 introduces the second independent variable "the currency exchange lei/euro", resulting a correlation coefficient of 0.978 and a determination report of 0.956. This implies the fact that 95.6% of the fluctuation of "net assets of privately administered pension funds" is explained by the fluctuation of the "reference interest rate", respectively, of "the currency exchange lei/euro". Moreover, by introducing the second independent variable into the regression model, the standard error of the estimate significantly decreases from 390.75 to 266.86.
According to table no 2, it becomes obvious that the other three independent variables studied, namely, the credit interest rate, the deposit interest rate and the BET-C index, are not considered in the model, because of their insignificant level of influence over the value of the net asset of privately administered pension funds.
The test t and the value Sig. serve for testing the regression coefficients, meaning the hypothesis according to which there is no significant correlation between the dependent variable and the independent variable. One may notice that, for the resulting model no 2, considered as the final alternative for the analysis, the significance threshold, Sig., takes higher values than those allowed, namely, the value of 0.05, which rejects the hypothesis according to which there is a significant correlation between analyzed variables, they being excluded from the model.
The regression coefficients calculated for each of the two models of the variables included here are illustrated in Table no 3, Annex no 2.
According to this study, the test t assumes high values for each variable, and the significance threshold, Sig., takes very low values (inferior to 0.05), which allows us to reject the hypothesis indicating a significant correlation between the analyzed variables, meaning slight errors determined by certain random measurements.
We observe that, the influence of the two selected variables over the net asset of privately administered pension funds, the second pillar, is optimum (Sig. <0.05), and the tolerance is higher than *1 - Adjusted R square* (1 - 0.953 = 0.047) for each dependent variable which *eliminates the risk of non-collinearity*. VIF (Variance Inflation Factor = 1/Tolerance) supports the collinearity analysis, being able to express a non-collinearity if it exceeds the value of 10.
In our case, for the two variables included in the model, the value of VIF is lower than 10, which confirms the lack of non-collinearity for these variables.
Considering the calculated coefficients expressed in the column B of the Table no 3, Annex no 2, the equation no 1presents the linear model of multiple regression identified for the studied variable:

$$Y = 1659{,}258 - 619{,}85 \cdot X_1 + 1376{,}999 \cdot X_2 \qquad (1)$$

where: Y – net asset of privately administered pension funds, the second pillar;
X_1 – reference interest rate;
X_2 – currency exchange lei/euro.

5. Conclusions

The present paper aims at providing an evaluation of the impact generated by certain factors of influence on the value of compulsory private pension fund assets, based on statistical methods and o series of data on a gap of 32 months. This goal is achieved by means of the multiple linear regression equation which allows the estimate of the value of total net asset of privately administered pension funds according to two variables selected in the model.
The interpretation of the coefficients achieved from the equation (equation no 1) reveals that, according to data analyzed for the period of May 2008 – December 2010, on a short time horizon, the following correlations are manifested:
-if the value of the currency exchange lei/euro increases with one point, the value of the net asset increases with 1,376 million lei;

-if the reference interest rate increases with one percentage, the value of the total net asset decreases with 0.619 million lei.

The experience of the value fluctuation of privately administered pension fund net assets is highly important, firstly beacause of its effects on the increase and the decrease of invested values for the insured persons' accounts, under the circumstances of constantly maintaining their contributions and, implicitly, the results achieved through these investments.

Thus, the evolution of the currency exchange rate and of the monetary policy interest rate (reference interest rate) highly influences the assets of privately administered pension funds.

According to the achieved analysis, we should consider that, on a short time horizon, an increase of the reference interest rate will determine a slight decrease of the net asset of privately administered pension funds, an effect which has to be counter-balanced by a potential reallocation of pension funds towards investments providing better results. The analysis reveals the fact that, the evolution of the credit interest rate and of the deposit interest rate does not affect privately administered pension fund assets, while we have already pointed out, in a previous study, that it influences the optional pension fund assets, the third pillar. As well, the stock market index BET-C does not influence privately administered pension fund assets, although, shares register a significant value, of 12% of the total investments of privately administered pension fund assets.

Therefore, in order to counter-balance the effects determined by the diminution of the net asset value of privately administered pension funds, we should elaborate, on a short time horizon, a dynamic mix of their investments able to adapt to the fluctuations of their influence factors. Thus, new opportunities will be generated in order to achieve the efficiency of pension funds and to prevent the diminution of the value of insured individuals' contributions to these pension funds.

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Notes

(1)Markets submitted to the study: Great Britain, Switzerland, Holland, Germany, France, United States of America, Canada, Brazil, Australia, Hong Kong, South Africa, Ireland, Japan.

This paper represents a synthesis of a study which will be published entirely into a future publication.

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Annex no 1.

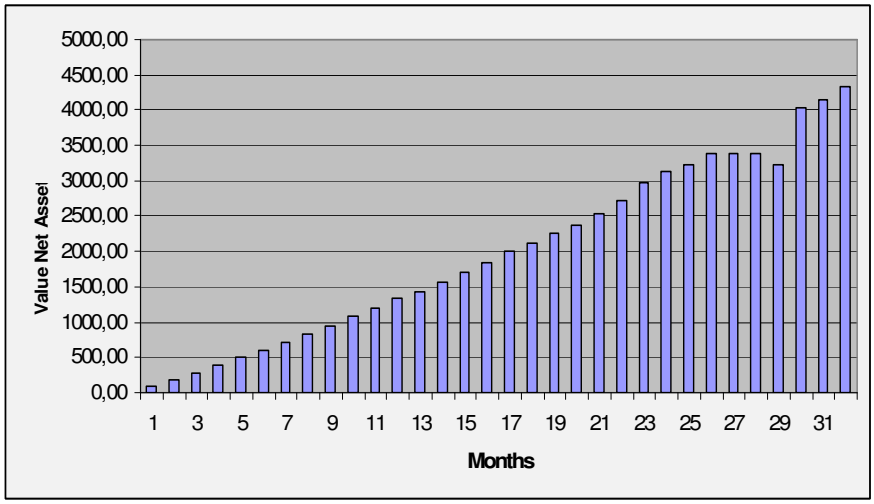

Figure no 1. Net assets evolution of privately administered pension funds in Romania, 2nd Pillar, during May 2008 - December 2010 (thousands RON)

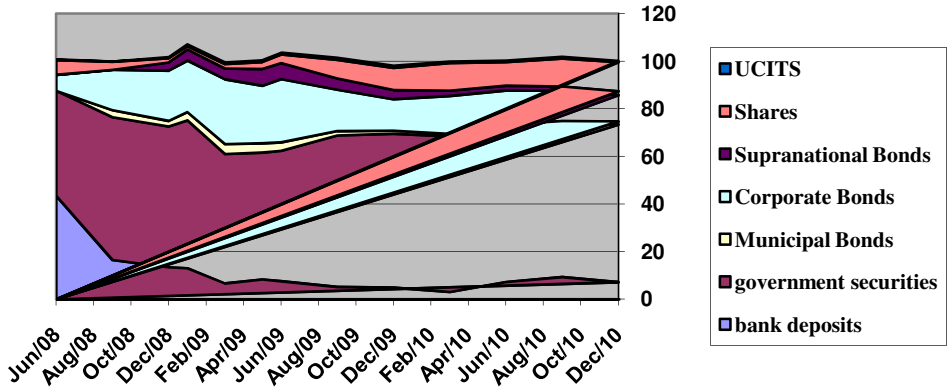

Figure no 2. Evolution of net assets of privately administered pension funds in Romania, the second pillar, for the period June 2008 – December 2010

Source: Data processed based on the data published on the website CSSPP, http://www.csspp.ro/evolutie-indicatori/, *section statistics - data series*

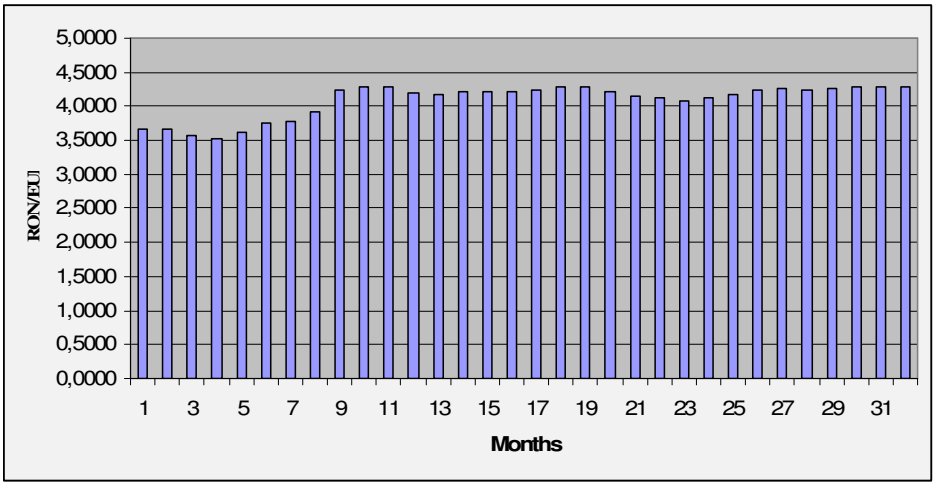

Figure no. 3. Evolution of currency exchange rate RON/Euro in Romania, during May 2008 - December 2010

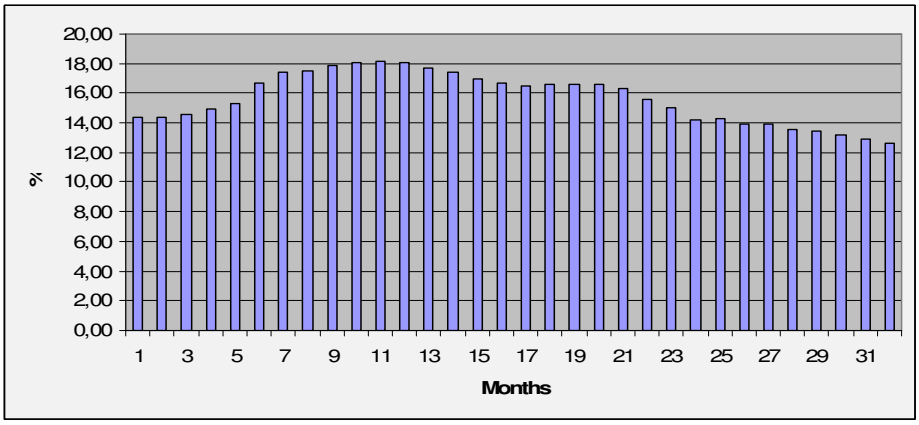

Figure no 4. Evolution of credit interest rate in Romania,
during May 2008 - December 2010 (%)

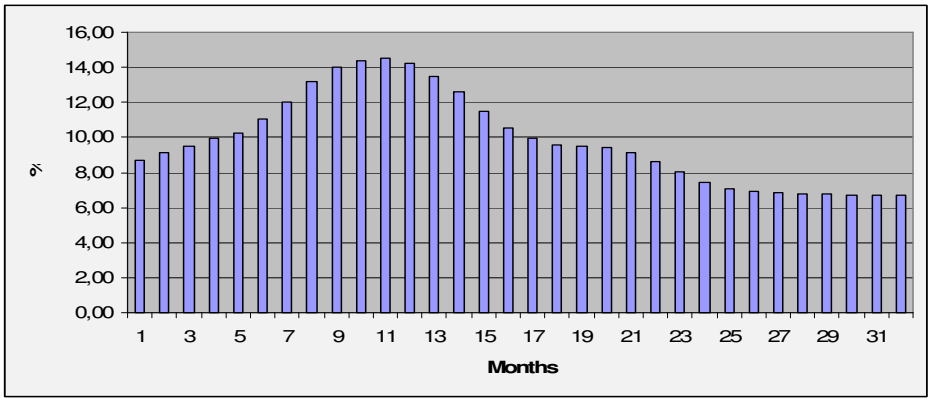

Figure no 5. Evolution of deposit interest rate in Romania,
during May 2008 - December 2010 (%)

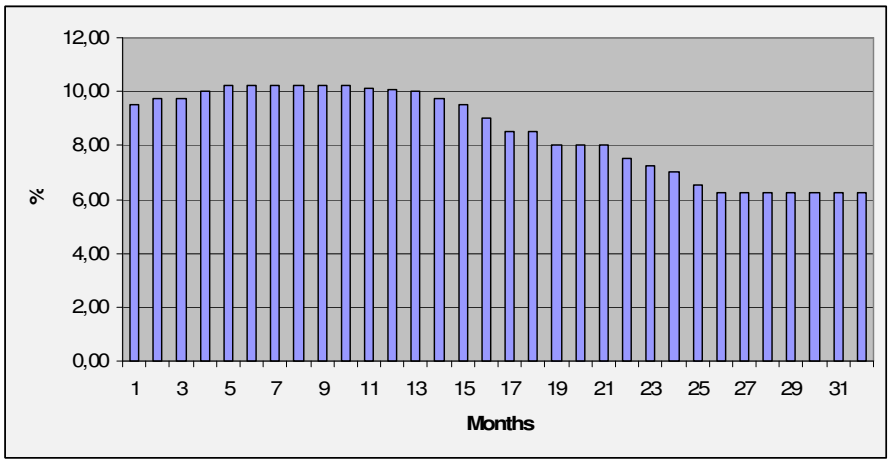

Figure no 6. Evolution of reference interest rate in Romania, during May 2008 - December 2010 (%)

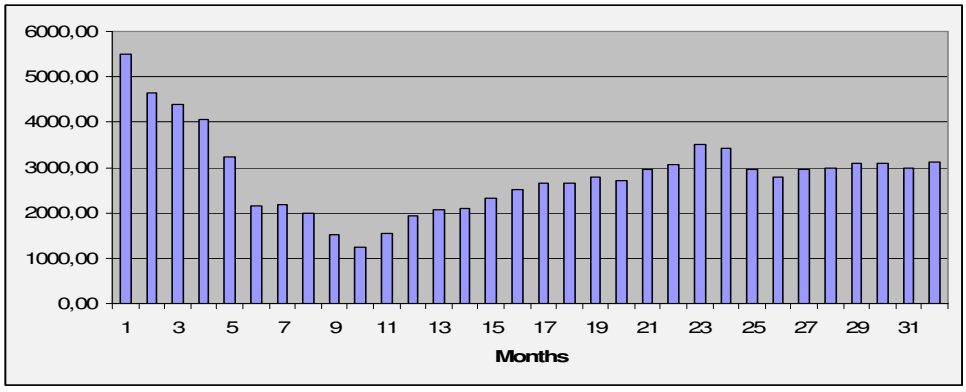

Figure no. 7. Evolution of BET-C index in Romania, during May 2008 - December 2010

Annex no 2

Model Summary

Table no 1

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.950[a]	.903	.900	390.74947	.903	271.089	1	29	.000
2	.978[b]	.956	.953	266.85732	.053	34.178	1	28	.000

a. Predictors: (Constant), Reference interest rate

b. Predictors: (Constant), Reference interest rate, Currency exchange rate lei/euro

c. Dependent Variable: Net assets of privately administered pension funds

Excluded Variables

Table no 2

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	Currency exchange rate lei/euro	.268[a]	5.846	.000	.741	.739	1.354	.739
	Credit interest rate	.285[a]	3.502	.002	.552	.363	2.756	.363
	Deposit interest rate	.491[a]	5.420	.000	.716	.205	4.869	.205
	BET-C Index	-.239[a]	-5.456	.000	-.718	.875	1.143	.875
2	Credit interest rate	-.091[b]	-.784	.440	-.149	.118	8.473	.087
	Deposit interest rate	.185[b]	.973	.339	.184	.043	23.175	.032
	BET-C Index	-.109[b]	-1.465	.155	-.271	.269	3.712	.227

a. Predictors in the Model: (Constant), Reference interest rate

b. Predictors in the Model: (Constant), Reference interest rate, Currency exchange rate lei/euro

c. Dependent Variable: Net assets of privately administered pension funds

Regression coefficients for the dependent variable, net assets of privately administered pension

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	8193.433	379.023		21.617	.000		
Reference interest rate	-724.315	43.992	-.950	-16.465	.000	1.000	1.000
2 (Constant)	1659.258	1147.263		1.446	.159		
Reference interest rate	-619.850	34.956	-.813	-17.732	.000	.739	1.354
Currency exchange rate lei/euro	1376.999	235.538	.268	5.846	.000	.739	1.354

a. Dependent Variable: Net assets of privately administered pension funds

funds

Table no 3