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## **Statistic Study of Banking Efficiency Ratios**

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### **Introduction**

In order for a more relevant financial-economic analysis, we realized a statistic processing of data resulted from financial statements for the period 2001-2006. Essentially, the statistic study has concentrated around "RETURN ON EQUITY" (ROE) indicator, which in our opinion, is the main financial efficiency criterion. The number of values registered for each statistic variable is relevant, taking into consideration that the data from the six annual balance sheets are highlighted at quarterly level.

### **Data and methods**

Due to presentation reasons, which correspond to statistic links, we shall use the following symbols for the financial-economic indicators from the annual financial statements:

ROE - Financial Profitability Ratio;

RACADEPA - Assets Covering with Attracted Deposits Ratio;

DOBACTIV - Active Interest;

DOBPASIV - Passive Interest;

GAP - Gap between Active and Passive Interest;

FDCLNEBA - Funds attracted from non-banking customers;

DATORII - Total Attracted Funds;

FLUXNUM - Total Cash-Flow;

PROVR\_CH - Provisions;

CREANTE - Receivables;

DATORII - Debts;

RACLICH - Current Assets Ratio;

LUXFIN - Financing Cash-Flow;  
 GESTRLIC - Liquidity Risk Financial Administration;  
 FLUXINV - Investment Cash-Flow;  
 INDSOLV1 - Solvency 1Indicator;  
 CAPNIV1 - Level 1 Equity;  
 CAPNIV2 - Level 2 Equity;  
 CAPNIV3 - Level 3 Equity.

In the following, we shall analyze some of the most significant statistic links which have been identified at many Romanian banks level, based on the data from the annual financial statements, during the period 2001-2006.

### Results

Another factor which influences ROE variance by almost 50% is the ratio of assets covering with attracted deposits (RACADEPA). The following information is significant in this issue:

The regression result for the dependent variable: ROE

$R = 0.7228$ ;  $R^2 = 0.5224$ ;  $R^2_{\text{adjusted}} = 0.4985$ ;

$F(1,20) = 21.883$ ;  $p < 0.00014$ ; standard estimation error: 1.5493

	coef. $a_i$	St. ERR		
		For $a_i$	t(20)	p-level
$a_0$	37.03123	7.499546	4.93720	0.000079
RACADEPA	-0.42407	0.090655	-4.67790	0.000145

### CORRELATIONS

	RACADEPA	ROE
RACADEPA	1.00	-0.72
ROE	-0.72	1.00

### COVARIANCE

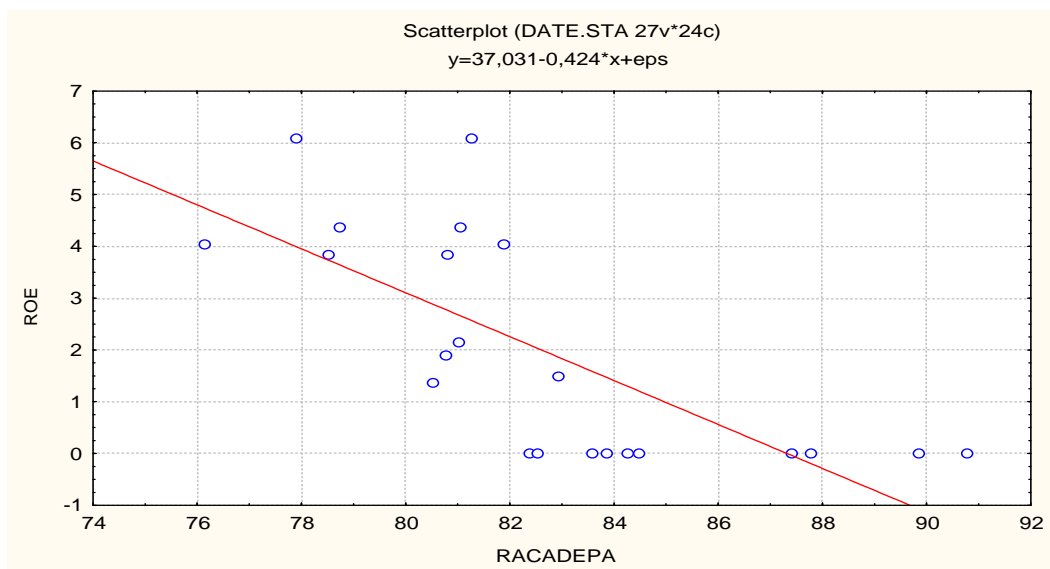
	RACADEPA	ROE
RACADEPA	13.9	-5.9
ROE	-5.9	4.8

The econometric model between ROE and RACADEPA is:

$$ROE_t = 37.03 - 0.42 \cdot RACADEPA_t + \varepsilon_t$$

Which means that for an increase by one percent of RACADEPA, ROE decreases by 0.42 %.

**Figure 1: ROE and RACADEPA Correlation**



The statistic links between the ROE variance and the following elements are interesting: active interest, passive interest, and the difference between them (GAP). In the following, we present information which resulted from data processing, in order to analyze their significance.

The regression result for the dependent variable: ROE

$$R = 0.9108; R^2 = 0.8296; R^2_{\text{adjusted}} = 0.8211;$$

$$F(1.20) = 97.419; p < 0.0000; \text{ standard estimation error: } 0.9853$$

	coef. $a_i$	St. ERR		
		For $a_i$	t(20)	p-level
$a_0$	-2.63217	0.507519	-5.18635	0.000045
DOBACTIV	0.14873	0.015069	9.87013	0.000000

**CORRELATIONS:**

	DOBACTIV	ROE
DOBACTIV	1.00	0.91
ROE	0.91	1.00

There is a direct link between ROE and DOBACTIV, meaning that with an increase by one percent of active interest, ROE will increase by an average 0.14 %. DOBACTIV influences ROE variance by 82%. Moreover, there is a high level of correlation between the two indicators.

In order to analyze the link between ROE and passive interest we use the information below.

The regression result for the dependent variable: ROE

$R = 0.9066$ ;  $R^2 = 0.8219$ ;  $R^2_{\text{adjusted}} = 0.8180$

$F(1.20) = 92.349$ ;  $p < 0.0000$ ; standard estimation error: 0.94596

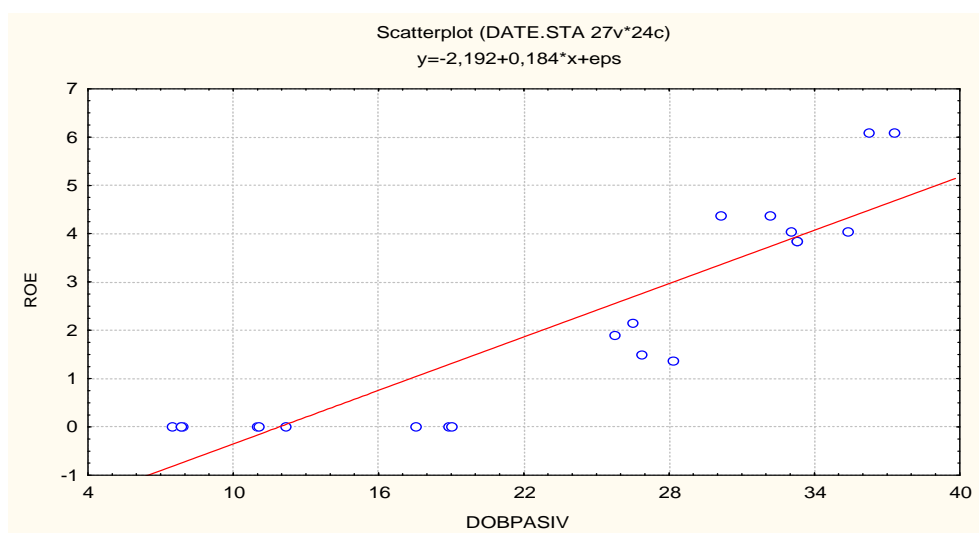
	coef. $a_i$	St. ERR		
		For $a_i$	t(20)	p-level
$a_0$	-2.19204	0.479001	-4.57628	0.000183
DOBPASIV	0.18426	0.019174	9.60985	0.000000

The link between ROE and DOBPASIV is almost equivalent to that previously studied, between ROE and DOBACTIV. In the last case, the model is the following:

$$ROE_t = -2.19 + 0.18 \cdot DOBPASIV_t + \varepsilon_t$$

This means that ROE variance is slightly sensitive to DOBPASIV variance ( $a_1 = 0.18$  %). Beside this, both the correlation level and the percent through which the factor explains ROE variance are almost the same.

**Figure 2: ROE and DOBPASIV Correlation**



ROE variance in correspondence with GAP can be analyzed as following:

The regression result for the dependent variable: ROE

$R = 0.7313$ ;  $R^2 = 0.5349$ ;  $R^2_{\text{adjusted}} = 0.5116$ ;

$F(1.20) = 23.002$ ;  $p < 0.00011$ ; standard estimation error: 1.5290

	coef. $a_i$	St. ERR		
		For $a_i$	t(20)	p-level
$a_0$	-2.02471	0.897001	-2.25720	0.035337
GAP	0.47868	0.099808	4.79603	0.000110

### CORRELATIONS

	GAP	ROE
GAP	1.00	0.73
ROE	0.73	1.00

### COVARIANCES

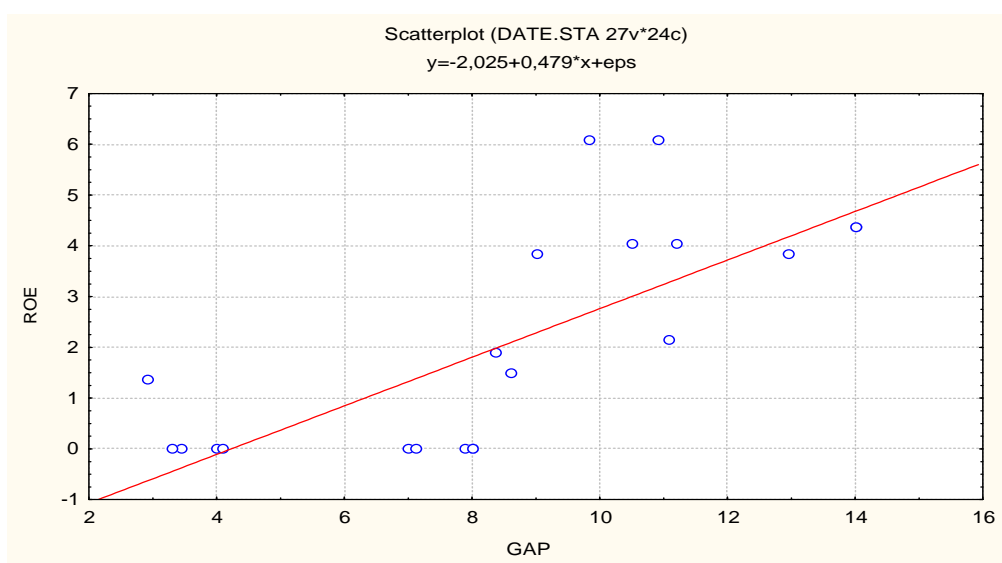
	GAP	ROE
GAP	11.2	5.85
ROE	5.5	4.79

The difference between active and passive interest explains by 51% ROE variance. Although there is a strong correlation between the two indicators, the link between them is the following:

$$ROE_t = -2.02 + 0.47 \cdot GAP_t + \varepsilon_t$$

With an increase by one percent of the gap between the two interests, the financial profitability ratio increases by 0.47 %.

**Figure 3: ROE and GAP Correlation**



Another factor which influences ROE variance is represented by the funds attracted from non-banking customers. The effect analysis is conducted based upon the following information:

The regression result for the dependent variable: ROE

$$R = 0.7167; R^2 = 0.5137; R^2_{\text{adjusted}} = 0.4849;$$

$$F(1.20) = 21.233; p < 0.00017; \text{ standard estimation error: } 1.5634$$

	coef. $a_i$	St. ERR		
		For $a_i$	t(20)	p-level
$a_0$	6.481126	1.033644	6.27017	0.000004
FDCLNEBA	-0.000405	0.000088	-4.59711	0.000175

**CORRELATIONS**

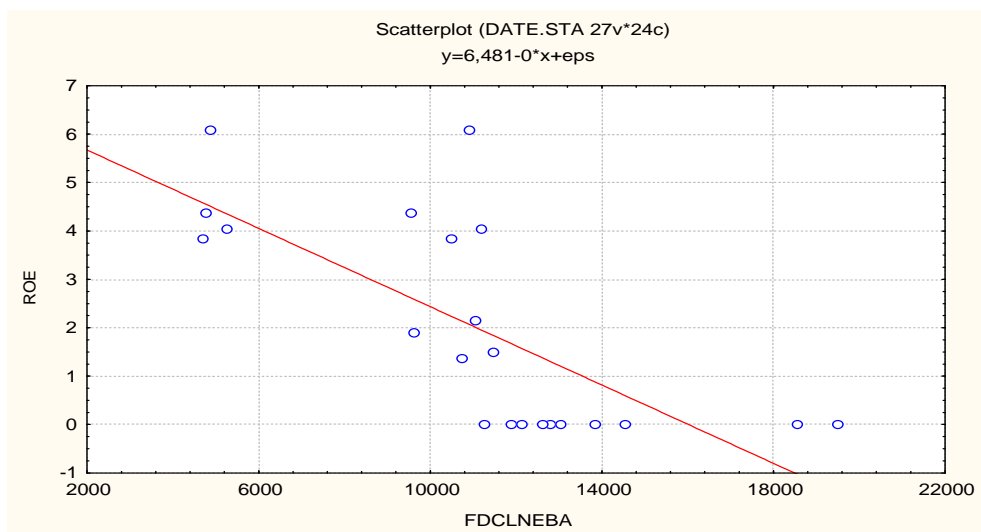
	FDCLNEBA	ROE
FDCLNEBA	1.00	-0.72
ROE	-0.72	1.00

The model which relates the two variables has the following structure:

$$ROE_t = 6.48 - 0.000405 \cdot FDCLNEBA_t + \varepsilon_t$$

It is observed that for an increase by a million lei of the funds attracted from non-banking customers, the financial profitability ratio decreases by an average 0.00405 %. There is a high enough correlation between the two indicators ( $\rho = -0.72$ ). Based upon the data above, it is observed that FDCLNEBA factor influences ROE variance by 49%. Obviously, there are also many other factors which influence ROE variance.

**Figure 4: ROE and FDCLNEBA Correlation**



The total funds attracted by the bank (DATORII) represent another factor which influences ROE variance. For the analysis we take into consideration the following information:

The regression result for the dependent variable: ROE

$$R = 0.6363; R^2 = 0.4049; R^2_{adjusted} = 0.3751;$$

$$F(1.20) = 13.609; p < 0.00145; \text{ standard estimation error: } 1.7295$$

	coef. $a_i$	St. ERR		
		For $a_i$	t(20)	p-level
$a_0$	6.831070	1.364906	5.00479	0.000068
DATORII	-0.000338	0.000092	-3.68898	0.001454

CORRELATIONS

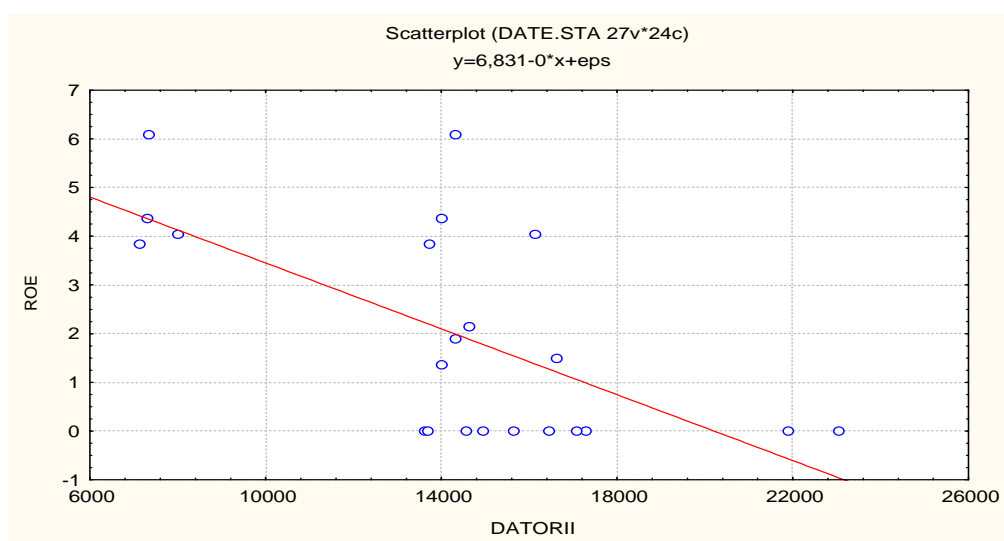
	DATORII	ROE
DATORII	1.00	-0.64
ROE	-0.64	1.00

The link between the two variables is:

$$ROE_t = 6.83 - 0.000338 \cdot DATORII_t + \varepsilon_t$$

It is observed that the DATORII influence effect upon ROE is almost the same as in the case of the FDCLNEBA factor. For an increase by one million lei of DATORII factor, profitability ratio decreases by 0.000338 %. The accounting effect can be converted to a more convenient form, if DATORII factor is transformed in billion lei. Only 37% of ROE variance is explained through DATORII. Between the two indicators, the correlation level is above average,  $\rho = -0.64$ .

**Figure 5: ROE and DATORII Correlation**



Possible influences of factors which can influence ROE variance are also important for study. In this way, we analyzed the following correlations which allow us to quantify one factor variance effect upon others. In order to study the correlation between DATORII and FDCLNEBA we use the following information:

The regression result for the dependent variable: DATORII

$$R = 0.9688; R^2 = 0.9385; R^2_{adjusted} = 0.9358;$$

$$F(1.22) = 336.27; p < 0.0000; \text{ standard estimation error: } 1047.8$$

	coef. $a_i$	St. ERR		
		For $a_i$	t(20)	p-level
$a_0$	2834.793	680.9076	4.16326	0.000405
FDCLNEBA	1.036	0.0565	18.33759	0.000000

CORRELATIONS

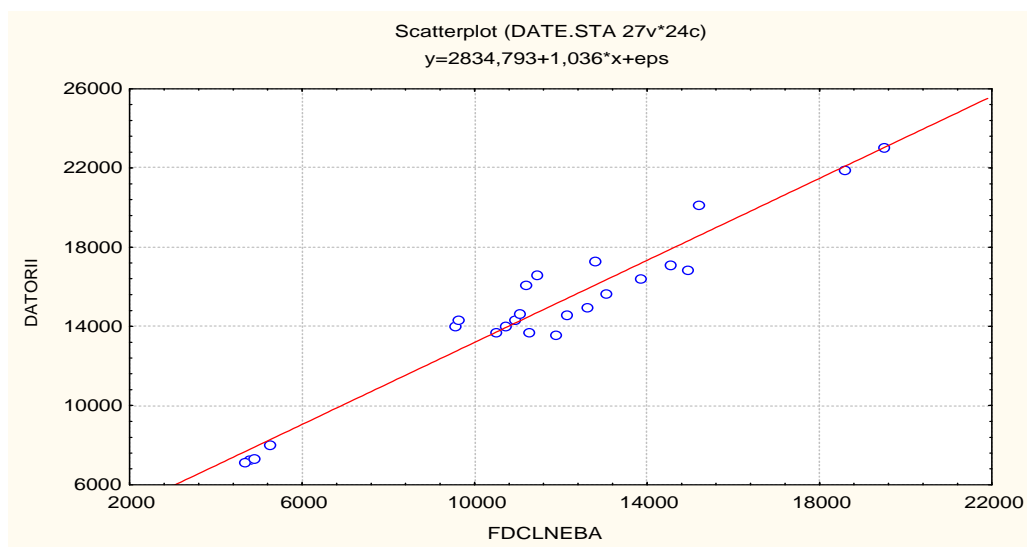
	FDCLNEBA	DATORII
FDCLNEBA	1.00	0.97
DATORII	0.97	1.00

The interaction between the two variables can be studied with the help of the model:

$$DATORII_t = 2834.793 + 1.036 \cdot FDCLNEBA_t + \varepsilon_t$$

This means that if funds which are attracted from non-banking customers increase by one million, then debts increase by 1.036 millions. FDCLNEBA explain DATORII variance by 53%. It is observed that there is a high correlation level between the two indicators,  $\rho = 0.97$ .

**Figure 6: DATORII and FDCLNEBA Correlation**



The analysis of the link between active (passive) interest and funds which are attracted from non-banking customers makes the object of an interesting study. The dependence between DOBACTIV and FDCLNEBA is based on the following:

The regression result for the dependent variable: FDCLNEBA

$$R = 0.6524; R^2 = 0.4257; R^2_{adjusted} = 0.3996;$$

$$F(1.22) = 16.310; p < 0.00055; \text{ standard estimation error: } 2997.6$$



	coef. $a_i$	St. ERR		
		For $a_i$	t(20)	p-level
$a_0$	17330.79	1580.083	10.96828	0.000000
DOBACTIV	-193.69	47.960	-4.03855	0.000549

### CORRELATIONS

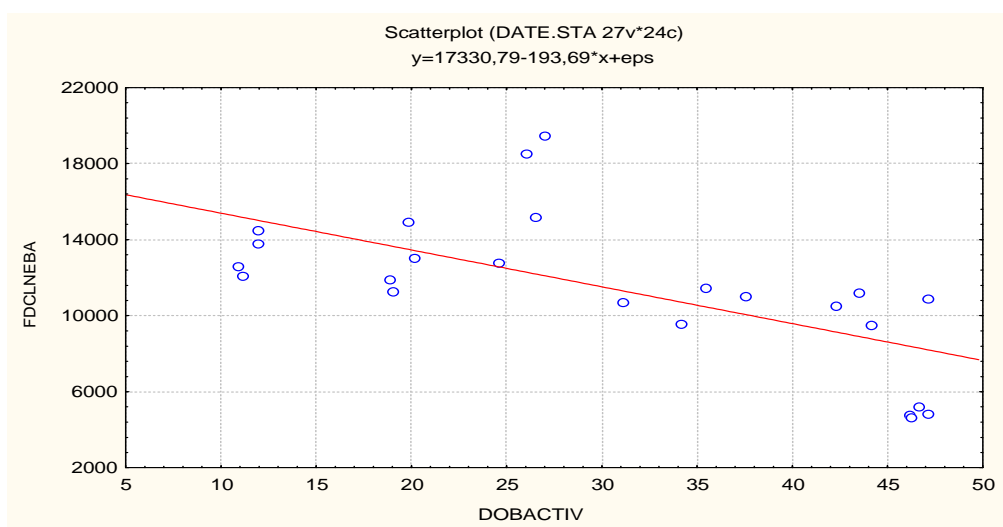
	DOBACTIV	FDCLNEBA
DOBACTIV	1.00	-0.065
FDCLNEBA	-0.65	1.00

DOBACTIV influence upon FDCLNEBA can be summarized in the following model:

$$FDCLNEBA_t = 17330.79 - 193.69 \cdot DOBACTIV_t + \varepsilon_t$$

If the active interest increases by 1%, then the funds attracted from the non-banking customers decrease by 193.69 million lei. FDCLNEBA variance is explained through the DOBACTIV variance by 40%. The correlation level between the two indicators is:  $\rho = -0.65$ .

**Figure 7: FDCLNEBA and DOBACTIV Correlation**



The correlation between FDCLNEBA and DOBPASIV is studied based on the information below.

The regression result for the dependent variable: FDCLNEBA

$$R = 0.6389; R^2 = 0.4082; R^2_{\text{adjusted}} = 0.3813;$$

$$F(1.22) = 15.178; p < 0.00078; \text{ standard estimation error: } 3042.9$$

	coef. $a_i$	St. ERR		
		For $a_i$	t(20)	p-level
$a_0$	16597.,30	1460.525	11.36392	0.000000
DOBPASIV	-233.82	60.017	-3.89590	0.000777

### CORRELATIONS

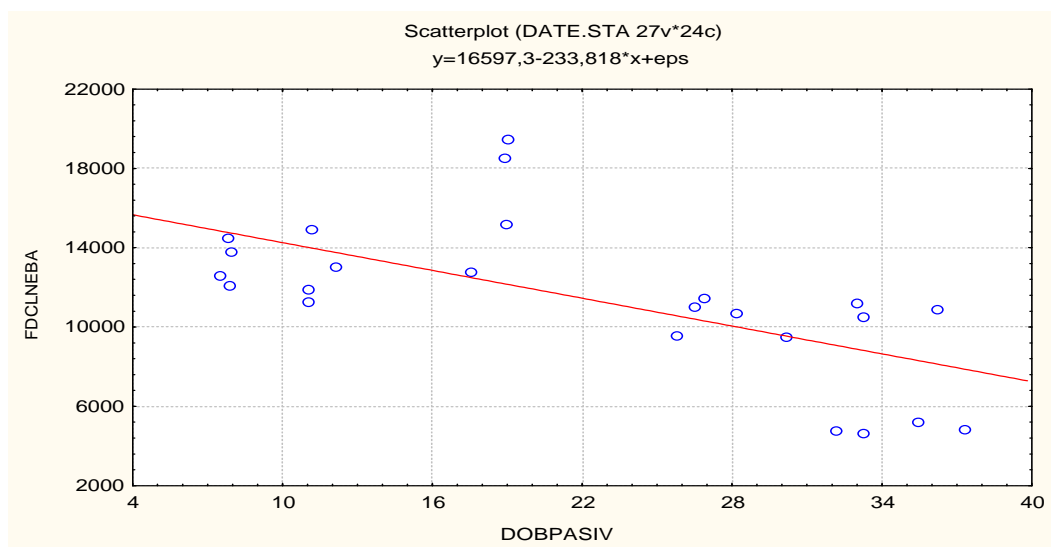
	DOBPASIV	FDCLNEBA
DOBPASIV	1.00	-0.64
FDCLNEBA	-0.64	1.00

The econometric model which links the two variables is the following:

$$FDCLNEBA_t = 16597.30 - 233.82 \cdot DOBPASIV_t + \varepsilon_t$$

which means that, for an increase by one percent of the passive interest, an average decrease by 233.82 million lei of funds which are attracted from non-banking customers is registered. Passive interest explains the variance of these funds by 38%. Correlation level between the two indicators is of -0.64.

**Figure 8: FDCLNEBA and DOBPASIV Correlation**



### Conclusions

Although ROE is influenced by many factors, a study concerning ROE variance regarding various factors, in the same time, cannot be conducted. This is also observed from the independent analysis of influence factors which emphasize a strong co linearity phenomenon.

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