

## NON-LINEAR PANEL DATA ANALYSIS FOR CAPITAL STRUCTURE AND ITS IMPACT ON PROFITABILITY

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**ABSTRACT.** This paper intends to establish the determinants of financial performance in 125 companies listed on the Bucharest Stock Exchange, over the 2003-2012 period. The analysis is based on descriptive analysis, linear and non-linear regression analysis. Return on assets, as performance proxy, is regressed on endogenous and exogenous variables. Results indicate that Romanian companies register higher returns when they operate with limited borrowings. Tangibility has a negative impact on return on assets, as long as investments are made from internal funds, affecting the level of earnings over short-term. The current financial crisis affects corporate performance, while inflation rates induce a loop effect in returns along with their fluctuation.

### 1. INTRODUCTION

The relationship between capital structure and corporate performance represents one of the most popular topics in the corporate finance literature. Over time, multiple models of capital structure were developed in order to identify financial decisions and determinants that would maximize the company value. An optimal capital structure refers to the proportion of equity and debt rewarded with the lowest cost of finance, and therefore is referred to identifying factors which maximize the company value through funding resources. Corporate financing decisions and their impact on corporate performance should be based on the interests of the major stakeholders, specifically shareholders, managers and creditors, and on debt and equity finance.

This paper intends to identify the influence of debt and equity ratios on return on assets, in companies listed on Bucharest Stock Exchange (BSE). It is expected to find a significant influence of debt and equity ratios on performance, but the relationship between financial structure and corporate performance can be understood in greater depth when related to capital structure determinants. Therefore, additional factors will be used as explanatory variables, along with capital structure ratios, in order to identify the influence on performance. Previous research, applied on the same sample, returned tangible assets, size, liquidity, business risk, inflation rate and the current financial crisis as determinants of financing decisions in Romanian listed companies.

### 2. LITERATURE REVIEW

Miller and Modigliani (1958) stated in their initial capital structure theory that, under perfect market conditions, the debt-equity ratio does not affect the market value of the company. These conditions cannot be accomplished in real financial markets, as they assume zero transaction costs, no differences between capital gains and dividend taxation, and free access to

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information for all investors. In fact, the choice between resources implies a tradeoff between business and financial risk, balancing somehow the debt tax shields against the bankruptcy costs, ensuring either an internal control from shareholders, or external from creditors. Companies choosing more debt avoid corporate ownership dilution and induce higher risks on their creditors. However, companies with large proportions of equity in their capital structure benefit of a better credit rating, but tend to operate more conservatively if they are controlled by risk-averse shareholders.

As long as the influence of debt and equity mix on performance is realised through other financial and economic factors, the literature does not state a strict relationship. Moreover, the debt ratios have different impact when considering its maturity. For example, Abor (2005) identified in his study a direct relationship between total debt ratio and return on equity, but a negative influence coming from long-term debt. Considering another performance proxy, return on assets, Huang and Song (2006) or Chakraborty (2010) discovered that leverage in Chinese firms have a negative influence on corporate performance. There are also studies that could not determine a statistically significant relationship between financing decisions and performance (Ebaid, 2009).

Studies investigating the relationship between financing decisions and performance usually employ some capital structure determinants that are also likely to influence profitability. Akintoye (2008) analyzed corporate performance in food and beverage companies operating in Nigeria, using performance indicators related to earnings and dividends. Beside the capital structure influence, he discovered that taxation, business risk, financial flexibility and managerial behavior are determinant factors for performance. He also acknowledged that an optimal debt-equity mix minimizes the cost of capital while maximizing the value of company, and that any changes to this mix would alter corporate value. Considering the economic conditions, results indicated that companies raise more borrowed funds in order to avoid the tax burden, improving their performance.

Previous studies on Romanian manufacturing companies follow the Golden Rule of Financing, matching the life of an asset with the life of resources used for funding it. Moreover, if they need financial resources during high inflationary times, companies tend to access short-term debt (Vatavu, 2012). Other studies indicated that Romanian companies first use internal funds to finance their fixed assets, accessing more debt in case they require more funding for investments. In addition, profitable companies avoid debt as they are associated to higher liquidities and face lower levels of risk (Serghiescu and Vaidean, 2013). The matter refers to whether or not these characteristics are available for all Romanian companies. Although industrial sectors used to be characterized by specific debt ratios, the current trend indicates small differences in the sectoral degree of indebtedness if compared to the overall indebtedness of Romanian companies (Pirtea et al., 2010).

The empirical literature concerning the impact of capital structure on profitability leads to three inferences: the first one is that empirical studies focused on Romanian companies are rather limited; the second one is related to the period analysed, which does not take into account the macroeconomic changes related to the financial crisis; the third refers to the fact that studies rarely use both, internal and external factors, in order to identify determinants of performance. In order to overcome the gap in the literature, this paper intends to identify the effect of capital structure on profitability, for Romanian listed companies, using several determinants for both, capital structure and corporate performance. Although studies tend to use debt as capital structure proxy, this research will refer to equity, thus testing as well the robustness of previous results. In order to improve the precision of estimations the analysis includes not only the linear effect of equity on profitability, but also the nonlinear effect, by estimating a cubic model which takes into account the cube of independent variables in the regressions.

### 3. DATA AND METHODOLOGY

**3.1. Sample and variables.** The sample consists of 125 companies listed on the BSE. Based on their summarized balance sheet, indicators were computed over a period of 10 years, from 2003 up to 2012. To ensure results precision, only certain categories of companies were selected for this sample:

- in order to reduce the number of outliers, delisted companies, those in dissolution stage or those registering negative equity values were not included in the sample;
- in order to ensure data reliability, only companies with financial data available for every year, from 2003 until 2012, were selected.

The financial performance evaluation should be easily explained through corporate financial decisions. For the performance proxy, return on assets is considered, being a profitability indicator. It is expected to be positively related to equity. The proxy is estimated by earnings before interest and tax scaled by total assets.

$$ROA = \frac{\text{Earnings before interest and tax}}{\text{Total Assets}} \quad (3.1)$$

The capital structure will be expressed through equity ratio. Equity, as main component of the capital structure, is the easiest to define, consisting of the common and preferred stock plus retained earnings, which are summed up in the shareholders' equity account on the balance sheet. This invested capital also refers to the capitalization of companies, representing a permanent type of funding which supports companies growth and assets. For this analysis, equity ratio is considered the most suitable of all capital structure proxies because from all types of resources, Romanian companies utilise long term debt the least. In addition, shareholders equity and total assets were collected from balance sheets, computing the equity ratio as presented in the next formula:

$$\text{Equity} = \frac{\text{Shareholders Equity}}{\text{Total Assets}} \quad (3.2)$$

Tangibility has two conflicting influences on profitability. On one hand, Himmelberg et al. (1999) determined a positive effect considering that fixed assets, through their role of collateral, ensure control as they are closely monitored. Therefore, these assets tend to reduce the agency conflict between creditors, managers and shareholders. On the other hand, companies with higher levels of tangible assets tend to be less profitable, indicating a negative relationships. Deloof (2003) and Nucci et al. (2005) argued that companies with higher levels of liquidity, compensating for reduced values of fixed assets, have more investment opportunities over the long term, focusing on innovation and research and development. Numerous studies identified the negative relationship between tangibility and profitability (Zeitun and Tian, 2007; Weill, 2008; Nunes et al., 2009). In order to test the effect of tangibility on profitability, the ratio (*tang*) is calculated by dividing the sum of fixed assets to total assets:

$$\text{tang} = \frac{\text{Fixed Assets}}{\text{Total Assets}} \quad (3.3)$$

It is expected for firms with growth opportunities to generate higher profits from investments, and thus having higher rates of return. From this perspective, growth opportunities should increase business profitability. Most empirical studies confirm this direct relationship between growth opportunities and profitability (Psillaki and Margaritis, 2007; Zeitun and Tian, 2007; Nunes et al., 2009). On the other hand, negative relationships between these variables were identified for specific industries (Margaritis and Psillaki, 2010). Studies from literature use either assets or sales in order to calculate the companies' dimension. But in the context of this analysis, the size variable will be calculated as the logarithm of sales turnover, in order to level up the values to the ratios.

$$size = \log (Sales\ Turnover) \quad (3.4)$$

Liquidity should have an essential role in determining profitability, as it is a measure of income sources, indicating how safe the operating activities are. However, when liquidity ratios are very high, it may not indicate a risk-aversion, but a poor management of current assets, especially of inventories and accounts receivables. The explanatory variable used in this paper is the current ratio:

$$liquid = \frac{Current\ Assets}{Short - term\ debt} \quad (3.5)$$

Risk may be one of the key factors in determining performance, . In this paper, risk is measured by the standard deviation of the profitability. Companies with larger dispersion are expected to generate higher returns. on the contrary, well-capitalized companies are expected to be less risky, with limited profits (Wasiuzzaman and Tarmizi, 2009).

$$risk = stdev \left( \frac{Earnings\ before\ interest\ and\ tax}{Total\ Assets} \right) \quad (3.6)$$

Wasiuzzaman and Tarmizi (2009) argue that the positive effect of inflation on corporate profitability is due to the fact that banks and creditors anticipate inflation and adjust interest rates accordingly, gaining more profits ahead of the raising costs. However, companies are not able to react so quickly suffering over the increase in the costs ahead, which is stronger when the inflation fluctuation is unanticipated (Sufian and Chong, 2008). In order to capture the exogenous influence of macroeconomic conditions, a common variable (*inflcr*) is computed, incorporating both inflation rate and crisis period.<sup>1</sup>

$$inflcr = inflation\ rate \times crisis \quad (3.7)$$

**3.2. Descriptive analysis.** The average return on total assets is 3.9%, which indicates rather limited asset efficiency for most Romanian listed companies. The capital structure ratios demonstrate a preference for equity, as internal resources represent approximately 65% of the capital.

Tangibility indicates greater usage of fixed assets and regardless their operational activity, the companies analysed own on average just below 60% of tangible assets. However, in order to reduce extreme values, the sample did not include companies in intermediation or consultancy fields, which do not require large levels of fixed assets. The mean of the size proxy (7.3) is rather large for most companies, comparing to the minimum (3) and maximum (10.3) values, showing that on average, companies listed on the Bucharest Stock Exchange register annual sales above ten millions lei. Disregarding the extreme values, liquidity ratio shows that current assets exceed short-term debt over two times. In addition, the risk proxy proves that the earnings are highly volatile: although the average risk does not imply that Romanian companies face unstable earnings over long periods of time, the standard deviation of this variable is high. Finally, the variable incorporating the inflation rate and financial crisis has a maximum value of 0.079 and an average of 0.029.

Variable	Mean	Std. Dev.	Min	Max
ROA	0.039	0.116	-1.108	0.656
TotEq	0.642	0.237	0	0.993
Tang	0.586	0.214	0.018	0.997
Size	7.318	0.799	4.040	10.29
liquid	2.22	1.861	0.011	9.881
Risk	0.158	0.685	0	11.719
inflcr	0.028	0.030	0	0.079

<sup>1</sup>Crisis is assigned value 0 from 2003 until 2007, and 1 from 2008 until 2012.

Based on the graphic illustrated in Fig.1, starting from 2006 return on total assets decreased, indicating a slight increase in 2010. It can be assumed that during the crisis investments were limited, or more importantly, companies began to divest in order to overcome financial difficulties, preserving their most profitable activities. At the end of the decade analysed the average value of return on assets indicated a general loss for Romanian companies, confirming the economic downfall following the financial crisis. Considering the capital structure ratios, it seems that Romanian companies have, in general, a preference for equity. The ratio varied across time, from 54.6% in 2003 to 57.3% in 2012, indicating the largest proportion of equity (61.5%) just when the bubble burst in Romania as well. According to the graphic, the average debt levels gradually declined across the period, from 45.7% to 37.5%, indicating that most companies listed on the Bucharest Stock Exchange tried to limit their risks and financial obligations by reducing their borrowed funds. However, although the level of debt decreased over the decade, the profitability was still affected indicating a low level of asset efficiency. Therefore, it would be useful to analyse the level of earnings before interest and tax and total assets, these being the components of the profitability ratio.

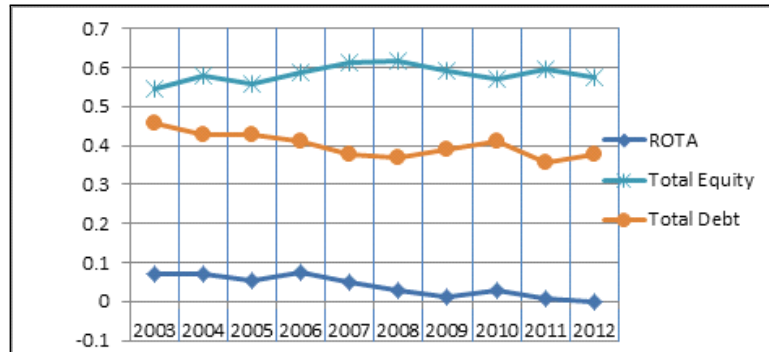


FIGURE 1. Evolution of capital structure ratios and return on total assets

The second graph, illustrated in Fig. 2, indicates an increase of 300% in the level of total assets, from an average of 150 millions lei in 2003 to 450 millions lei in 2012. Based on the evolution of capital structure ratios, the assets accumulated were financed through equity. Going more into depth, most of the assets increase was based on the value of fixed assets, which rose from 93 millions lei to 345 millions lei. Current assets almost doubled, from 57 millions lei in 2003 to 110 millions lei in ten years time. Considering the ascending trend of assets and the slight increase in equity ratio it can be concluded that Romanian companies constantly invested over the decade based on their internal resources, avoiding an increase in their financial risks by accumulating borrowed funds.

Based on the descriptive statistics and graphics, in order to test potential factors that influence the performance and effectiveness of Romanian companies, the main assumed hypothesis of this paper is that the capital structure has a significant impact on corporate performance. Considering the equity ratio as a proxy for capital structure, the following hypothesis is considered:

*H: There is a non-linear relationship (inverted U-shape) between equity and performance.*

Based on the graphs previously presented a relationship between assets and capital structure was deduced, and therefore the assets proxy should be relevant in establishing the influence of capital structure ratios on return on total assets.

Raising income from sales revenues is one of the main objective of any company focused on profits, growth or market share. Therefore, turnover should have an important relationship with ROA, indicating an effective use of assets generating higher level of returns. The sales turnover was leveled through logarithm and considered a proxy for company size.

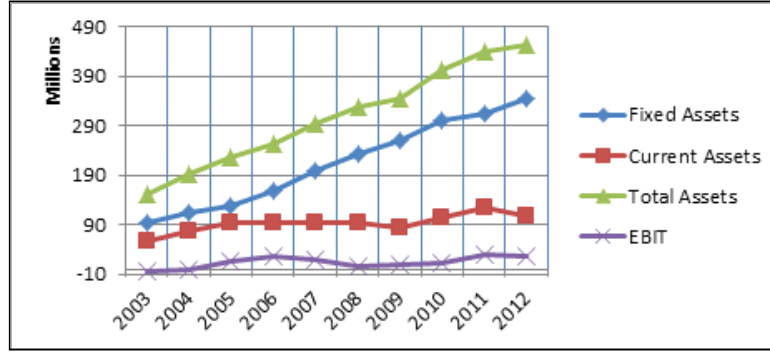


FIGURE 2. Evolution of assets and earnings before interest and tax

The company's ability to pay its current obligations should be an important influencing factor of corporate performance. Liquidity ratios are usually dependent on businesses' maturity. Therefore, it is expected for start-up or young companies to have low levels of liquidity, while mature companies could indicate poor management or a need for additional capital when they lack of cash and other current assets to cover accounts payable and short-term liabilities. Considering that the sample analysed includes only companies listed on the Bucharest Stock Exchange, it can be assumed that all are mature. Consequently, a direct relationship between liquidity and performance may be assumed up to a certain level, as an excess of liquidities could reflect poor inventory and production management, or a large level of cash for safety, which could yield more in short-term investments.

The business risk will be defined based on earnings volatility, more specifically on the standard deviation of earnings over the period analysed. In order to avoid large figures for the risk proxy, the rate of earnings over assets was used, obtaining in this way figures of the same range as the variables previously discussed.

The last variable was considered in order to test the influence of crisis and inflation over the performance of Romanian companies. The inflation rate is an annual average and the crisis is a dummy variable, with 0 values between 2003 and 2007 and 1 after 2008. Therefore, the inflation and crisis variable has standard values for all sample companies. This variable comprises economic conditions which are expected to adversely influence corporate profits, affecting sales and operations.

**3.3. Methodology.** This paper analyzes the relationship between equity and performance, through capital structure determinants, using a 10-year panel data. The performance indicators are considered a function of financial and non-financial indicators, as presented in equation (3.8):

$$Performance = f(equity, tangibility, size, liquidity, risk, inflation, crisis) \quad (3.8)$$

Based on this function, the following equation expresses the linear model of performance.  $\alpha_i (i = 1 \dots 125)$  represents the unknown intercept of every company,  $t (t = 2003 \dots 2012)$  is the year analysed,  $\beta_s$  are the coefficients for every independent variable and  $\alpha_{it}$  is the error term.

$$ROA_{it} = \alpha_i + \beta_1 Equity_{it} + \beta_2 tang_{it} + \beta_3 size_{it} + \beta_4 liquid_{it} + \beta_5 risk_{it} + \beta_6 inflcr_{it} + \varepsilon_{it} \quad (3.9)$$

The correlation matrix between the variables mentioned is presented in Table 2. As the coefficients do not show a high level of correlation between the independent variables, all of them will be included in the model. Besides, in order to test its robustness, the model will be tested through comparative regressions, presented in more detail in the following section.

	ROA	debt	tang	size	liquid	risk	tax	inflcr
ROA	1							
debt	-0.264	1						
tang	-0.171	-0.332	1					
size	0.108	0.127	-0.081	1				
liquid	0.197	-0.494	-0.129	-0.198	1			
risk	-0.009	-0.059	0.033	-0.125	0.213	1		
tax	0.013	-0.031	-0.050	0.004	0.041	-0.010	1	
inflcr	-0.169	-0.107	0.077	-0.011	0.128	0.069	-0.0084	1

#### 4. RESULTS

**4.1. Linear regression analysis.** Regression results presented in Table 3 indicate a strong positive relationship between the capital structure ratio and corporate performance. All regressions suggest higher returns for companies disposing of more equity. Therefore, the indebtedness of companies is affecting their performance. As long as large equity ratios are connected to higher returns on assets, it would be important to see if debt is used to finance large investments in assets. If companies have to pay their financial obligations related to borrowed funds by consuming their earnings, this would affect profitability over short-term, because investments will become profitable after the payback period.

	OLS	Quantile 10	Quantile 50	Quantile 90
TotEq	0.190 (13.84)***	0.237 (5.93)***	0.122 (9.67)***	0.177 (8.50)***
tang	-0.136 (-9.18)***	-0.059 (-2.04)*	-0.103 (-8.05)***	-0.23 (-9.02)***
size	0.029 (7.86)***	0.041 (4.60)***	0.019 (6.36)***	0.018 (3.99)***
liquid	0 (-0.25)	0 (-0.30)	0 (0.11)	0 (-0.13)
risk	0.001 (0.43)	0.001 (0.22)	0.002 (0.52)	0.001 (0.22)
inflcr	-0.710 (-7.30)***	-0.236 (-1.03)	-0.474 (-6.80)***	-0.836 (-5.12)***
cons	-0.201 (-6.43)***	-0.464 (-5.69)***	-0.11 (-4.07)***	0.049 (1.21)
R Squared	0.21	0.12	0.12	0.18
***, **, * Significant at 1%, 5%, 10% level				
t statistics in parentheses				

At first appearance, an increase in fixed assets induces a decrease in corporate performance. First of all, investments in fixed assets are realised based on internal funding, as Romanian companies follow the pecking order theory in order to cover for additional risks. Secondly, fixed assets do not necessarily increase sales along with the additional production. Moreover, as performance is calculated as a ratio of earnings over assets, an increase of tangible assets has an immediate effect of decrease in ROA, but over a longer period of time, it will also induce an increase in profits. It is then expected for tangible assets to have a nonlinear relationship with return on assets.

The size coefficient is also statistically significant, and as predicted, it indicates a positive relationship with ROA: higher sales turnover are associated with assets that are used more

efficiently. Considering the previous relationship indicating that a large proportion of fixed assets affects earnings, it means that in terms of their operating activity, sales are raising based on investments in fixed assets, but over a longer term, it offsets the decrease in earnings consumed for these investments.

Higher levels of general liquidity ratio affect returns on total assets according to the negative coefficient of liquidity. The link supports the theory, as too much liquidity is the first sign for unefficient inventory and operational management or risk aversion reflected by extreme caution. However, the relationship between liquidity and ROA is neglectable as it is neither statistically significant, nor of an impact considering the nul coefficients.

Although earnings volatility is higher for more performant companies, the fiscal pressure produces a decrease in asset returns. Risk does not have statistically significant coefficients. Still, the external factors employed in the model have the strongest impact from all variables regressed on ROA. Thereby, inflationary periods and the financial crisis altered asset effectiveness and even more than that, discontinued or affected the activity and sales of companies listed on the Romanian stock exchange.

According to the R Squared values returned for these linear regression models, the seven variables included in the analysis, capturing both internal and environmental influences, may explain up to 21% of the variation in corporate performance. Observing the quantile regression results, although the influence demonstrated by the sign is maintained for all variables across the models, there is a high variation in coefficients. Therefore, quantile regressions suggest that there might be nonlinear effects at the level of impact exercised by the explanatory variables on the dependent one. Hence, in order to capture nonlinear effects, the second stage of analysis will test a polynomial fit such as:

$$\begin{aligned}
 ROA_{it} = & \alpha_i + \beta_1 Equity_{it} + \beta_2 Equity_{it}^2 + \beta_3 Equity_{it}^3 + \beta_4 tang_{it} + \\
 & \beta_5 tang_{it}^2 + \beta_6 tang_{it}^3 + \beta_7 size_{it} + \beta_8 size_{it}^2 + \beta_9 size_{it}^3 + \\
 & \beta_{10} liquid_{it} + \beta_{11} liquid_{it}^2 + \beta_{12} liquid_{it}^3 + \beta_{13} risk_{it} + \\
 & \beta_{14} risk_{it}^2 + \beta_{15} risk_{it}^3 + \beta_{16} inflcr_{it} + \beta_{17} inflcr_{it}^2 + \\
 & \beta_{18} inflcr_{it}^3 + \varepsilon_{it}
 \end{aligned} \tag{4.1}$$

The nonlinear effects on performance proxy will be tested first with descriptive analysis based on graphical illustration of the relationships. Then, in order to identify the influence of every independent variable, comparative regression analysis will be conducted, starting with Pooled Ordinary Least Square (OLS), continuing with Fixed Effect (FE) and Random Effect (RE) models. Problems of endogeneity related to causality of exogenous variables to the dependent variable (especially the capital structure variable) are expected. Therefore, basic econometric methods such as OLS, FE and RE models may return inefficient estimates. In order to solve this problem, the generalized method of moments (GMM) proposed by Arellano and Bover (1995) and Blundell and Bond (1998) was employed. This method provides solutions to simultaneity bias, reverse causality and possible omitted variables. GMM method is used to solve the problems of endogeneity by using a series of instrumental variables generated by lagged variables.

**4.2. Testing for non-linear relationships between variables.** Non-linear models have the advantage to examine the relationship between two variables due to the parameter coefficient which explains a few significant increases or reductions in a variable which will influence other variables. So, it not only explains the direction of the existing relationship, but it also helps in explaining how far the changes in performance go in relations to the variables.

The relationship between returns and equity is rather linear, indicating a positive influence of internal funding on profitability. However, two slight decreases and a level flattening can be observed in the trend shown in Fig. 3. Overall, higher returns on assets are associated with higher equity ratios. The graph shows that Romanian companies register losses when the



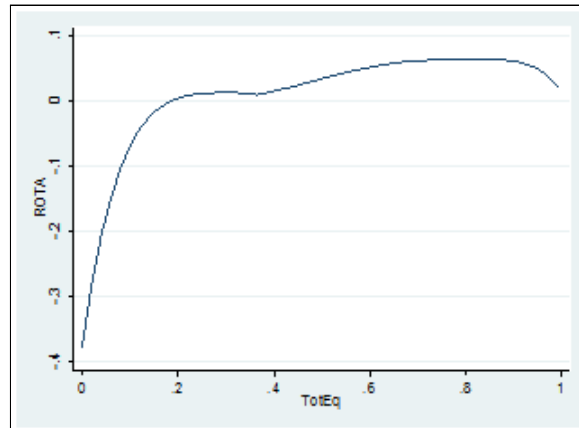


FIGURE 3. Polynomial relationship between ROA and equity ratio

equity ratio is lower than 20%. When equity is between 20% and 40% of the capital structure, return on assets is very close to 0, but indicating profits. In other words, in order to reach the equilibrium point, operating activities should be funded by at least 20% internal resources. Returns increase, with a reduced pace, when equity is between 40% and 70% of the capital. Return on assets is maximised for equity ratios between 0.7 and 0.9, indicating another decrease when equity ratios exceed 0.9. This shows that, in case of Romanian companies, an optimal capital structure is consisting of 10 to 30% borrowed funds, the rest being equity and internal funding (70 to 90%).

Although on the first impression an increase in the ratio of fixed assets to total assets will produce an increase in corporate returns, a large proportion of fixed assets affects the profitability indicator. Thereby, the fourth graph shows that returns on total assets are decreasing when the value of tangible assets cover more than 37% of the total assets value. When the ratio of tangible assets exceeds this proportion, returns are affected, indicating two thresholds of strong decrease. Although large values of tangibility indicate that those companies are operating in production sectors. However, tangibility ratios exceeding 0.8 either represent exceptional cases, even for this category, or an evidence of poor management of current assets.

Size proxy has a nonlinear relationship with ROA. First of all, there is a direct relationship between the variables. Then, for revenues between 100 millions and 5 billions lei, returns are severely restricted. Size values exceeding the second threshold indicate another direct relationship, although these large revenues are exceptional in the sample analysed (less than 2% of the data). As expected, higher revenues are associated to higher returns, taking also into account that companies with sales below one million lei do not cover their operational expenses, registering losses. By association, companies with larger equity ratios are more profitable, sustaining their increase in revenues through internal resources.

According to the graph reflecting the interdependence between liquidity and return on assets, large liquidity ratios are associated to large returns on assets. When current assets cover the short term liabilities, liquidity is associated to profits. Moreover, the strongest upward trend reflects the optimal value for liquidity ratio, according to theory. The highest performance in terms of asset returns (10%) is associated to an extreme case, when current assets cover short-term liabilities eight times. This could be considered an inefficient management of current assets. Nevertheless, according to the descriptive statistics, the average liquidity ratio for the companies included in the sample, operating in various industries, is 3.

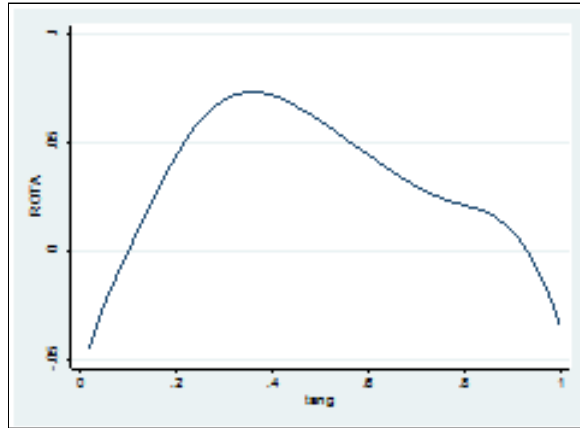


FIGURE 4. Polynomial relationship between ROA and tangibility

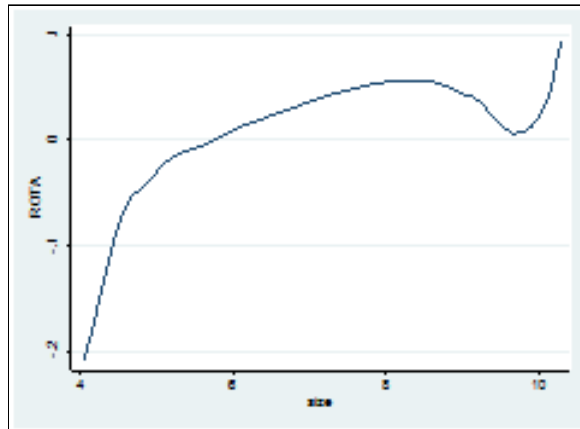


FIGURE 5. Polynomial relationship between ROA and size

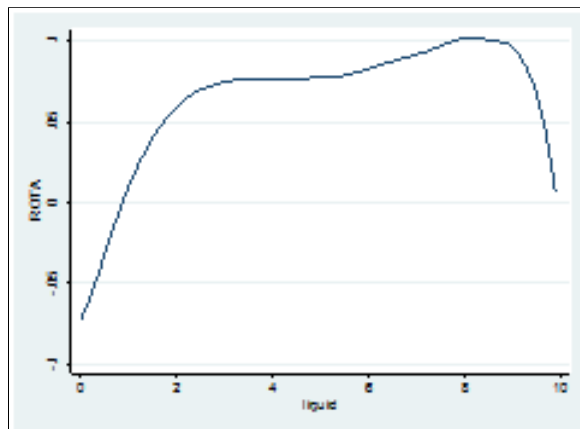


FIGURE 6. Polynomial relationship between ROA and liquidity

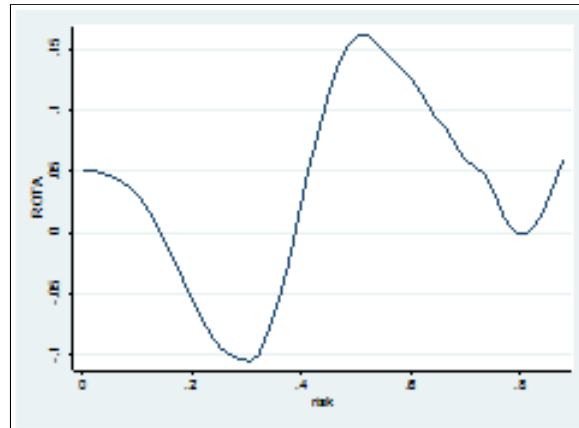


FIGURE 7. Polynomial relationship between ROA and risk

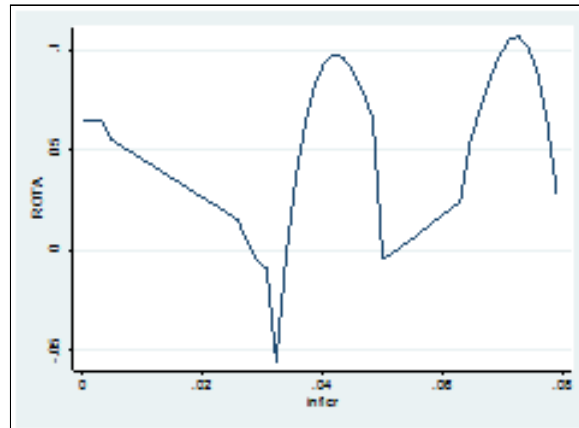


FIGURE 8. Polynomial relationship between ROA, inflation and crisis

The relationship between earning volatility and returns on total assets reflects the highest nonlinearity with large deviations. To be more specific, up to a standard deviation of 3% in profitability, return on assets is indirectly correlated. Then, for a risk between 3% and 5%, companies register the highest performance, but larger deviations have opposite influence on return on assets. So far, the polynomial relationship with performance is best explained by means of risk.

The inflation and crisis variable takes into account only the crisis period, as long as the dummy variable for crisis is 0 before 2007. The last graphic reflects a nonlinear relationship between ROA and inflcr variable. Also, during the second sub-period analysed, inflation decreased from 7.9% in 2007 to 3.4% in 2012. Hence, according to the graphic and the correspondence to inflation, the average return on total assets was around 2% in 2007, revealing losses in the last year analysed.

**4.3. Non-linear regression analysis.** The comparative regression analysis returns robust results (Table 4) in terms of the relationship between capital structure ratio and performance. The equity is positively correlated to return on assets, with coefficients statistically significant at 1% level. Confirming the nonlinear relationship, the squared variable indicates a negative relationship, and the cube is positively related to ROA. These coefficients are also statistically

significant. Confirming the graph illustrating the relationship between equity and ROA, which indicated two stages of growth followed by a reduced downfall, the main results are consistent to the previous ones, obtained through linear analysis: higher levels of equity ensure greater returns.

Tangibility coefficients oscillate from their base values to the squared and cube values, but they are statistically significant regardless the regression model employed only in the first case. Therefore, we can confirm the linear regression results, according to which companies use their assets more efficiently if they dispose of less tangible assets. As long as the average proportion of fixed assets in total assets is 58%, and according to the polynomial graph, a tangibility ratio larger than 40% has a negative influence on returns, both the linear and nonlinear analysis previously described is confirmed by the comparative regression analysis.

The coefficients of size variable are neither robust, nor statistically significant. Their sign alternates from the base values to the squared and cube, but it also differs according to the regression models employed. Therefore, considering these comparative results, the level of sales is not a determinant factor of asset efficiency.

Liquidity coefficients confirm the nonlinear relationship between general liquidity and return on assets, through the alternating sign. However, coefficients of the squared and cube liquidity variable are almost null and they are not statistically significant. Therefore, it can be concluded that a large level of liquidity has a constraining impact on return on assets, although observing the coefficients, this negative influence is very limited.

Table 4. Determinants of return on total assets (non-linear analysis) (I)						
	OLS	FE	RE	FE corr	FE corr (time FE)	GMM
TotEq	0.771 (7.11)***	0.702 (6.98)***	0.735 (7.25)***	0.702 (2.69)***	0.715 (2.82)***	0.751 (6.08)***
TotEq2	-1.215 (-5.46)***	-0.904 (-4.11)***	-1.071 (-4.99)***	-0.904 (-1.82)*	-0.926 (-1.91)*	-1.023 (-4.15)***
TotEq3	0.732 (5.09)***	0.544 (3.67)***	0.649 (4.58)***	0.544 (1.91)*	0.559 (1.98)**	0.683 (4.46)***
tang	-0.052 (-0.27)	-1.045 (-4.43)***	-0.493 (-2.37)*	-1.045 (-2.55)**	-1.053 (-2.58)*	-0.604 (-2.80)***
tang2	-0.208 (-0.56)	1.257 (2.76)***	0.461 (1.14)	1.257 (1.73)*	1.279 (1.77)	0.489 (1.12)
tang3	-0.137 (-0.62)	-0.592 (-2.18)**	-0.2 (-0.83)	-0.592 (-1.46)	-0.602 (-1.48)	-0.257 (-0.97)
size	-0.013 (-0.07)	0.47 (1.16)	-0.014 (-0.06)	0.47 (1.39)	0.461 (1.32)	-0.685 (-1.29)
size2	0.008 (0.31)	-0.079 (-1.28)	0.008 (0.24)	-0.079 (-1.49)	-0.08 (-1.44)	0.093 (1.17)
size3	-0.0004 (-0.4)	0.005 (1.52)	0 (-0.27)	0.005 (1.74)	0.005 (1.72)*	-0.004 (-0.91)
liquid	-0.001 (-0.7)	-0.004 (-3.37)***	-0.003 (-2.31)*	-0.004 (-2.64)***	-0.004 (-2.32)**	-0.004 (-2.88)***
liquid2	0 (-0.26)	0 (1.69)	0 (0.83)	0 (1.98)**	0 (1.67)*	0 (2.57)***
liquid3	0 (0.54)	0 (-0.9)	0 (-0.24)	0 (-1.44)	0 (-1.19)	0 (-2.21)**

	OLS	FE	RE	FE corr	FE corr	GMM
					(time FE)	
risk	-0.005	-0.014	-0.015	-0.014	-0.009	-0.005
	(-0.21)	(-0.52)	(-0.57)	(-0.53)	(-0.32)	(-0.25)**
risk2	0.004	0.004	0.005	0.004	0.002	0.001
	(0.47)	(0.46)	(0.61)	(0.45)	(0.28)	(0.03)
risk3	-0.0002	0	0	0	0	0
	(-0.44)	(-0.48)	(-0.6)	(-0.47)	(-0.33)	(0.22)
inflcr	-3.533	-3.493	-3.269	-3.493		-1.720
	(-2.85)***	(-3.17)***	(-2.92)***	(-3.77)***		(-2.28)**
inflcr2	66.699	67	60.853	67		17.229
	(1.68)*	(1.92)*	(1.7)*	(2.32)**		(0.78)
inflcr3	-354.75	-372.575	-323.246	-372.575		-2.406
	(-1.12)	(-1.35)	(-1.14)	(-1.57)		(-0.01)
2005					-0.019	
					(-1.98)**	
2006					-0.011	
					(-1.08)	
2007					-0.039	
					(-3.32)***	
2008					-0.061	
					(-4.46)***	
2009					-0.069	
					(-5.60)***	
2010					-0.063	
					(-5.97)***	
2011					-0.073	
					(-6.60)***	
2012					-0.075	
					(-6.15)***	

	OLS	FE	RE	FE corr	FE corr	GMM
					(time FE)	
L.ROA						0.098
						(3.82)***
cons	-0.223	-0.919	-0.138	-0.919	-0.877	1.451
	(-0.49)	(-1.06)	(-0.26)	(-1.33)	(-1.24)	(1.24)
F/Wald test	19.77***	18.59***	382.83***			1880.74***
R2	0.27	0.29	0.26	0.28	0.30	
Hausman		35.00***				
TimeFE			11.44***			
Wald			46849.6***			
Wooldridge			7.318***			
Sargan (prob)						31.22
(prob)						(0.31)
Arr.Bond						-3.85 (0.00)
ord.1 (prob)						-0.04 (0.97)
ord.2 (prob)						

\*\*\*, \*\*, \* Significant at 1%, 5%, 10% level; t statistics in parentheses

Deviations in earnings should not be considered a determinant factor of performance, in terms of asset efficiency, as regression coefficients are not statistically significant. As long as risk was not relevant in the linear model either, it can be concluded that earnings volatility are not a determinant of return on assets.

Finally, the “U-shape” relationship between inflation, crisis and performance, and the continuous slopes are confirmed, otherwise being the strongest from all variables included in the model. Hence, the impact of economic conditions on corporate performance is very important. On one hand, higher inflation is associated with lower asset efficiency. However, when inflation exceeds 4% returns decrease, being followed by a gradual increase of ROA when inflation is between 5% and 7%, and so it continues the loop effect. This is due to rising prices which induce an instability in expenses, turnover and profits.

Based on the lagged dependent variable, the dynamic model shows that returns on assets are also related to their previous levels, having a positive and significant relationship with those. In other words, assets become more effective over time.

Unit-root tests were applied to the panel data in order to inspect if there is a possibility for spurious correlations among variables, but all variables have a stationary trend, and hence the regression analysis is appropriate.

Overall, regression models confirm that the ROA is influenced by equity, tangibility, liquidity, inflation and crisis variables. Based on the Hausman test the fixed effect model is more suitable for the sample. This model controls for differences across companies, which may alter results as long as companies operate and perform differently, according to their industrial affiliation. Previous researchers also concluded that fixed effects must be used to control for unobservable and time-invariant companies characteristics (MacKay and Phillips, 2005; Lemmon et al., 2008). The Wooldridge test for autocorrelation fails to reject the null hypothesis according to which there are no first order autocorrelation in the data, while the Wald test for homoskedastic error variance fails to reject the null hypothesis, confirming the presence of heteroskedasticity in the sample analysed.

For the corrected model, estimated coefficients of fixed-effects model take into account omitted time-invariant characteristics, and eliminate the heteroskedasticity and autocorrelation.

Based on the F and Wald test, the model is useful in determining ROA, the performance indicator. However, based on R-squared values the independent variables considered may explain up to 30% of the variance in asset returns. This means that additional variables should be taken into account in order to identify more important determinants of return on total assets. The probability associated to the Sargan test indicates that there are no valid overidentifying restrictions in the model. There is no second-order autocorrelation of errors because the test of second order autocorrelation (Arr.Bond) does not reject the hypothesis of absence of second-order autocorrelation

## 5. CONCLUSION

This paper tests the effect of equity on the profitability of Romanian companies listed on the Bucharest Stock Exchange. In addition, this article expands the empirical literature regarding the influence of equity on corporate performance. The reduced number of studies regarding Romanian companies, also aiming to identify the influence of the current financial crisis, motivated the choice for this research. The impact of equity on profitability was identified by using multiple regression models on a strongly balanced panel of 125 Romanian listed companies over the period 2003-2012. Moreover, the analysis used both the linear effect of equity on profitability, and the nonlinear effect, by estimating a cubic model.

This research indicated that capital structure has an important role in the performance of Romanian companies, confirming the conclusions of most studies focused on developing countries (Zeitun and Tian, 2007; Nunes et. al., 2009; Margaritis, D. and Psillaki, 2010; Pirtea et. al., 2010). Romanian companies are more profitable when they finance their operating activities through internal funds, but their investments are based on equity and internal funding.

Therefore, there is a tendency for pecking order theory, as Romanian companies require external financing only when their equity or liquidity ratios are limited. Also, in need of external finance, companies prefer borrowing funds to raising equity by selling shares, because accessing equity is uncommon due to Romania's underdeveloped financial market.

While large proportion of fixed assets affects the return on assets, this does not necessarily represent a problem because investments may return profits over a longer period of time. Moreover, Romanian companies tend to increase their equity ratio during times of high inflation and unstable conditions. Also, during times of financial constraints companies own more tangible assets. As a consequence, when the crisis triggered in 2007, Romanian companies indicated a decrease in return on assets. Despite of the unstable economy, results showed that companies continued to develop in order to maintain their market position and undertook new investments.

Although the pecking order theory confers more financial stability, there is a deficiency in short term investments, as long as they operate with extremely large liquidity ratios, not using their internal funds efficiently. Sales are based on short-term liabilities, and thus Romanian companies either have a poor management in terms of accounts receivables and inventories, or they are too risk-averse tending to accumulate large levels of cash.

Earnings were strongly affected by the crisis, registering important declines after 2007. It can thus be concluded that the performance of Romanian companies is deteriorating, although they are extremely cautious in raising their financial risks, tending to operate based on internal funds, and requesting short-term liabilities only in strict necessities. Due to the absence of a liquid financial market, Romanian companies depend on creditors when in need of external funding. But even in this case the large cost of interest and the level of taxation alter operating profits transforming companies into poor financial performers in terms of their net income. Altogether, the lack of efficient management in terms of current assets and the latest uncertain economic conditions deepen corporate financial difficulties.

Negative performance associated to deficient utilization of current assets provide managers with useful policy directions on appropriate capital structure and financial decisions. So far, this research indicated a poor management of current assets for Romanian companies.

On the basis of this study Romanian companies avoid liabilities in order to limit their risks. However, they cannot benefit of growth opportunities as long as they limit their investment on internal funding. In order to offer Romanian companies lower costs of long-term capital as a source of investments, a debt capital market should be developed, along with a capital market that ensures easy access to equity through share trading. As long as Romanian companies do not utilize their assets efficiently, it is recommended for companies to improve their operational processes, management and corporate strategies, in order to enhance their performance through effective utilization of assets.

Although large asset turnover ratios are desirable, what is considered high for one industry, may be low for another. For example, comparing a consultancy firm operating with reduced fixed assets, with a manufacturing company, which requires large machineries, plant and equipment, would be unreasonable. Therefore results may not be entirely accurate when the sample analysed comprises companies from different industries. Future analysis should test sub-samples of companies operating in the same industry, as long as the regression analysis in this paper proved that companies' characteristics influence the relationships between considered variables. However, results are robust in terms of their statistical significance, and thus, these conclusions are pertinent.

The macroeconomic variable comprising the effect of inflation and crisis has a strong influence on performance. An analysis on sub-periods, before and after the commencement of crisis, is necessary in order to test the results robustness.

The analysis should also be extended to different components of corporate debt, especially on short-term debt, as long as Romanian companies avoid long-term liabilities. Contradictory effects may be found in such cases. Finally, considering the fact that the relationship between equity and ROA is nonlinear, although this research could not delimitate the thresholds of

capital ratios, the analysis may be expanded by using econometric methods that evaluate the effects of nonlinearity as threshold models.

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