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SCIENTIFIC REVIEW

The Determinants of Capital Structure and Optimization: Evidence from the Power Sector

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ABSTRACT

The optimal capital structure differs between companies and depends on the nature of the business, the characteristics of the business, etc. Usually when business income is higher, there is a reduction in business risk, while, on the other hand, higher profits and accumulated profits lead to an increase in investments and debt. In the research 10 companies of the power sector, representing the stock exchange index ERS 10 were examined. The following dependent variable was used: short term debt to total liabilities (STDTL). The following independent variables were used: current ratio (CR), return on capital employed (ROCE), earnings before interest taxes depreciation (EBITDA), return on assets (ROA), return on equity (ROE), the tangibility of assets (TOA), firm size (FS) and gross domestic product growth (GDP growth). The research period covered the years from 2008-2018 on a semi-annual basis. The total number of observations was 220. The main objective of the paper is to determine explanatory factors that influence the changes in short-term indebtedness and profitability.

Key words: *capital structure, tangibility of assets, power sector, profitability, regression analysis*

JEL Classification: G3, G31, G32, M400

INTRODUCTION

Optimal theories of capital structure depend first and foremost on which economic and business enterprises the research is based on. For example, the trade-off theory is tax based, free cash flow theory is based on agency costs, while pecking order theory is based on differences in information. The theory of financial distress states that if a company has a higher share of tangible assets, it will use more loans and debts than a company with a high proportion of intangible assets, because businesses with more tangible assets may have lower costs of financial distress in the event of bankruptcy.

In emerging Central and Eastern European region some theories cannot be used in explaining the capital structure. Delcoure (2007) demonstrates influential factors that determine capital structure are characteristics of banking systems, legal systems, sophistication of financial markets and corporate governance. Also, results of this study can be used as argument for the market timing theory. The market timing theory does suggest that current conditions in financial markets have some influence on managers' capital structure decisions (Frank & Goyal, 2009).

The power industry of Republika Srpska deals with the production of electricity, the exploitation of raw materials required for electricity production, the sale of electricity, project

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management and other activities within its jurisdiction. The capital structure of the power sector of Republika Srpska consists of 65% participation of parent company, 20% vouchers, 10% pension and disability insurance and 5% restitution (The Power Sector of Republika Srpska, 2019).

In the post-crisis period, the power companies of Republika Srpska, with increased yield potential, created the basis for an increase in borrowing capacity, primarily short-term loans to banks due to the high share of current assets, and smaller amounts of cash and cash equivalents. The power sector of Republika Srpska is the leader in electricity exports in the region, which is evidenced by the fact that in 2018, 15% of total exports were related to foreign electricity sales, which certainly increases the yield potential (The Power Sector of Republika Srpska, 2019).

This paper will test whether a partial decline in revenue potential leads to an increase in short-term debt in the first place and how is it further reflected in profitability indicators. Therefore, the main objective of this paper is to investigate how firms compose their capital structure, that is, how selected independent variables influence firms to borrow short-term loans to a greater or lesser extent. The zero hypothesis supports the random effects model. On the other hand, alternative hypotheses support the fixed effects model. The following hypotheses will be tested:

- H0: Zero hypothesis: Random-effect model is appropriate.
- H1: First hypothesis: Fixed effect model is appropriate.

The small chi square value together with the associated small p - value leads to the conclusion that the null hypothesis is true, i.e., that all variations are equal. This paper consists of four parts and a conclusion. The first part refers to the introductory considerations and defining the aim of the research. The second part is a broad literature review. The third part refers to the empirical methodology and data. The fourth part refers to the obtained results. Finally, concluding considerations and specific recommendations are given.

LITERATURE REVIEW

Traditional theories of capital structure should be tested in the transitional Central and Eastern European region. According to the Pecking order theory, companies will first use retained earnings as their investment assets, and then move to debt and new equity only if necessary (Myers, 1984). Petersen and Rajan (1994) point out that leverage decreases with the years of business of the enterprise and, on the other hand, increases with size. They also claim that larger companies are better diversified, have better access to the capital market and borrow at more favorable interest rates.

Rajan and Zingles (1995) find that large firms are less susceptible to asymmetric information, more capable of acquiring equity and reducing debt capital, suggesting a negative association between leverage and size. According to Titman and Wessels (1988), smaller firms are less associated with financial institutions due to the impact of costs and leverage risks, and are less desirable for clients and banks charging high interest rates to smaller firms, while larger firms are offering competitive interest rates.

According to Ozkan (2001), i.e., according to his evidence, companies have a long-term leverage ratio and adapt to the target ratio relatively quickly, suggesting that target ratio and cost of adjustment are very important for businesses. The results also indicate that there is an inverse correlation between profitability, liquidity, growth opportunities, non-debt tax shields and the borrowing ratio of firms. Furthermore, Giner and Reverte (2001) claim that debt represents positive signal for firms with good prospect and investors negatively perceive differences between debt-to-equity ratio and its target level.

Empirical contributions on association between ownership structure and capital structure provided Brailsford, Oliver and Pua (2002). Specifically, significant positive linear relation

between external blockholders and leverage is suggested. At the same time, the authors find non-linear relation between managerial ownership and leverage.

In their research, Korajczyk and Levy (2003) came to the conclusion that macroeconomic parameters change over time, which in turn changes the decision on the capital structure of an enterprise. The value of a business will depend on changes in managerial decisions based on macroeconomic changes. In order to maintain the level of debt, managers should monitor and adapt to macroeconomic changes.

Pittman and Fortin (2004) investigated the relationship between auditor selection and debt pricing for public companies. They have come to the conclusion that riskier debtors must provide security for loans taken as interest rates rise, which is in line with business in the banking industry. Delcoure (2007) points out that companies in emerging Central and Eastern European region follow the modified pecking order theory.

Furthermore, Aggarwal & Kyaw (2009) report the higher importance of transparency factors regarding corporate capital structure for large firms. Also, using sample of 26.896 firm-years observation in the 14 European countries these authors documented that higher levels of audit intensity and financial reporting disclosures have positive association with debt ratio.

EMPIRICAL METHODOLOGY

The traditional OLS regression model represents an important method of identifying and testing certain theories of the capital structure and factors influencing the structure of capital (Rajan & Zingales, 1995). Based on the results of Breusch-Pagan LM test, the paper employs the pooled OLS regression model (FE model) and the random-effects GLS regression model to test the influence, significance and impact of selected independent variables on the determination and anticipation of the dependent variable. Therefore, fixed effects regression is a common model that can be used to control for omitted variables. Also, it allows us to evaluate the effects of independent variables on our dependent variable, where it is the main technique used to analyse panel data. Panel data are called cross – sectional time data that include multiple cases (such as businesses, countries, etc.). There are usually two types of information in terms of time series data, namely: the cross sectional information that reflects differences between subjects and time series information within subjects. In order to decide which method we should use we applied the Breusch-Pagan Test which is proposed by Trevor Breusch and Adrian Pagan (1979). *The Breusch-Pagan Test tests the heteroscedasticity of regression errors.* The test explains that error deviations are due to the linear function of one or more explanatory variables in the model. In order to achieve a better return on the observed variables, the following regression model has been set up:

$$SHTDTL_{i,t} = \alpha + \alpha_1 CR_{i,t} + \alpha_2 ROCE_{i,t} + \alpha_3 EBITDA_{i,t} + \alpha_4 ROA_{i,t} + \alpha_5 ROE_{i,t} + \alpha_6 TOA_{i,t} + \alpha_7 FS_{i,t} + \alpha_8 GDPgrowth + \varepsilon_{i,t} \quad (1)$$

where is:

- $CR_{i,t}$ – current assets to total assets of the i_{th} company in period t.
- $ROCE_{i,t}$ – return on capital employed of the i_{th} company in period t.
- $EBITDA_{i,t}$ - earnings before interest, taxes and depreciation of the i_{th} company in period t.
- $ROA_{i,t}$ – return on assets of the i_{th} company in period t.
- $ROE_{i,t}$ – return on equity of the i_{th} company in period t.
- $TOA_{i,t}$ – tangibility of assets of the i_{th} company in period t.
- $FS_{i,t}$ – firm size of the i_{th} company in period t.
- $GDPgrowth$ of the i_{th} company in period t.

DATA

Data have been collected from the stock exchange index created in the power sector at the Banja Luka Stock Exchange (ERS10 stock exchange index). This empirical study uses semiannual data for 10 companies. The research period covers 11 years, i.e., from 2008 to 2018. The dependent variable the ratio of short-term debt to total liabilities (STDTL) was used. Eight independent variables as current ratio (CR), return on capital employed (ROCE), earnings before interest, taxes and depreciation (EBITDA), return on assets (ROA), return on equity (ROE), the tangibility of assets (TOA), firm size (FS) and GDP growth were used. In Table 1 the explanatory variables, formulas, and expected effects of dependent and independent variables are given:

Table 1. A brief description of the dependent and independent variables in the model

Explanatory Variables	FORMULA	Expected Signs	Supported Theories
Debt	Short term debt to total liabilities	-	-
Liquidity	Current ratio (Current assets/Short-term liabilities)	Negative (-)	Trade-off theory
Profitability	Return on capital employed (ROCE)	Positive (+)	Trade-off theory
Profitability	Earnings before interest, taxes and depreciation (EBITDA)	Negative (-)	
Profitability	Net profit/Average assets (ROA)	Positive (+)	Trade-off theory
Profitability	Net profit/Average equity (ROE)	Negative (-)	Trade-off theory
Tangibility of assets	Fixed assets/Total assets	Negative (-)	Collateral view
Firm size	ln (Sales)	Positive (+)	Trade-off theory
GDP growth	GDP growth over the previous period	Positive (+)	Trade-off theory

Source: Authors own study

Return on assets (ROA) - It represents the ability of management to convert assets into earnings. Net profit represents the volume of earnings, but not how well the bank operates viewed relative, or in terms of their size. This is assessed by a comparison of ROA banks of different sizes (Đukić, 2011).

Return on equity (ROE) - measure of banks` profitability. It is decided to choose ROE due to the observed increase in the equity capital of banks in the global market and higher capital requirements for banks. It is the fact that many of the bank's operations are off-balance sheet but not on-balance sheet (Drozdowska & Witkowski, 2016).

Earnings before interest, taxes and depreciation (EBITDA) – is calculated by taking the net income of the business and adding interest, taxes, depreciation and amortization. So basically it takes sales revenue, and subtracts all expenses except interest, taxes, depreciation and depreciation. Therefore, EBITDA is a measure of the performance of a business, that is, of evaluating the performance of a business without affecting financial, tax and other decisions (Marr, 2012).

The tangibility of assets – represents an important balance sheet category that may cause an increase in indebtedness in the enterprise. Certain theories believe there is a positive correlation between the assets tangibility and leverage. Higher amounts of tangible assets can lead to increased indebtedness as tangible assets can be used as collateral for loan approval, which reduces bankruptcy costs. Also, tangible assets can be used to reduce agency costs incurred due to debt monitoring costs as well as an insufficient investment due to the presence of asymmetric information. The assumption is that companies that have higher amounts of fixed assets with a

larger amount of collaterals should consequently have a higher level of leverage in their capital structure (Jensen & Mekling, 1976).

***Firm size* (FS) - s**maller companies generally use less credit from banks in comparison with larger enterprises. That is for a few reasons. The core reason is that smaller companies can face the problems of asymmetric information, and banks with negative selection and moral hazard. This situation is particularly pronounced in Bosnia & Herzegovina. Also, smaller companies tend to be less diversified in terms of debt capital, compared to larger companies, which increases the chances of financial failure. On the other hand, larger enterprises have relatively lower direct costs of bankruptcy (Mc Connell & Pettit, 1984). In this regard, smaller companies have access to less capital, or they are offered a charge at substantially higher costs than large companies, which refuses them to use debt financing. Firm size is calculated by the natural logarithm of sales. Therefore, firm size is expected to be positively correlated with larger companies that use higher amounts of indebtedness.

***Current ratio* (CR) –** measures the ability of the company to settle its mature short-term liabilities with the total available working capital. The current ratio is expressed as a numerical value, and as its value increases, the enterprise operates more liquid, so that is able to repay short-term liabilities to creditors on time (Alihodžić, 2018).

***Return on capital employed (ROCE)* –** the main elements of the ROCE indicator are operating profit as well as capital employed. Therefore, ROCE compares earnings with the capital employed in the company. The ROCE indicator can be measured for several years in a row in order to find a trend of growth or decline in profitability. In other words, ROCE how much a business is gaining for its assets or how much it is losing from its liabilities (Marr, 2012).

***GDP growth* –** GDP is a widely used indicator that best describes the difference in wealth between countries. Also, GDP growth encourages businesses to make new investments. According to Smith and Watts (1992), GDP growth encourages companies to make new investments, which has an impact on the optimal choice of financing sources. GDP growth is measured as a percentage change in the growth rate of real gross domestic product. We assume that GDP growth will be positively correlated to leverage.

RESULTS

Descriptive statistics of the power sector of the Republika Srpska are shown in the Table 2. This shows that the GDP growth has a high value at 102.65% average. The tangibility of assets represents 85.25%, earnings before interest and taxes represent 26.28% and firm size represents 17.85%. In terms of standard deviation, the following independent variables recorded the highest volatility: earnings before interest, taxes, depreciation and amortization (15.08%), GDP growth (14.58%), then the current ratio (8.12%) and tangibility of assets (6.91%).

Table 2. Descriptive statistics of dependent and independent variables of the power sector in the Republic of Srpska for the period: 2008-2018

Variables	Observations	Mean	Std. Dev.	Min	Max
STDTL	220	8.102	7.575	0.02	29.44
CR	220	5.752	8.126	0.47	42.48
ROCE	220	0.509	1.726	-7.15	11.89
EBITDA	220	26.279	15.081	-17.22	65.37
ROA	220	0.164	1.098	-3.75	2.53
ROE	220	0.170	1.283	-4.62	3.06
TOA	220	85.254	6.915	66.98	97.72
FS	220	17.848	0.790	16.07	19.23
GDP growth	220	102.65	14.587	66.50	128.87

Source: Calculated by the authors (STATA 13.0)

The gross domestic product (GDP) in Bosnia and Herzegovina had a volatile character during the survey period, both due to the impact of the global economic crisis, the post-crisis period, and because of weakened export potential. Economic growth in Bosnia and Herzegovina in 2008 amounted to 5.5%, which was a slight decrease compared to previous years, because the effects of the crisis did not fully reflect by the end of the observed period. Just three years later, that is, in 2011, real GDP growth was only 1.9%, suggesting that the countries of Southeast Europe showed a vulnerability to distortions in the euro area during the recession period. In the post-crisis period, there was a certain stabilization of economic trends, where the real growth rate increased by about 2.6% as a result of the reduction of the external deficit and favourable external conditions. The real growth rate in 2017 was about 3%, which is the result of favourable economic developments in EU countries and to a lesser extent in the countries of the region. The energy sector of Bosnia and Herzegovina accounts for about 1/3 of total industrial production and is an important factor in its stability (Directorate for Economic Planning, 2017). GDP growth encourages businesses to expand their businesses.

Korajczyk and Levy (2003) conclude that macroeconomic conditions change over time, where the structure of capital also changes over time in certain sectors of activity. The average value of the fixed assets of the power sector of Republika Srpska for the period 2008 to 2018 was approximately 85% of total assets, which is a consequence of the nature of the activities of the selected companies. On the other hand, the average value of short-term debt to total liabilities for the period 2008 - 2018 was about 8%, which is a small amount of bank debt, which also leads to the conclusion that it is a healthy revenue potential that needs to be maintained. Changing macroeconomic conditions will affect the change in the value of the enterprise. The table 3 shows the correlation between the dependent and independent variables of the power sector in the Republic of Srpska for the period: 2008-2018.

Table 3: Correlation matrix between dependent and independent variables of the power sector in the Republic of Srpska for the period: 2008-2018

Variables	STDTL	CR	ROCE	EBITDA	ROA	ROE	TOA	FS	GDP growth
STDTL	1.000								
CR	-0.528	1.000							
ROCE	0.048	0.046	1.000						
EBITDA	-0.567	0.620	0.237	1.000					
ROA	0.221	0.211	0.642	0.517	1.000				
ROE	-0.213	0.192	0.636	0.472	0.994	1.000			
TOA	-0.561	0.014	0.100	0.302	-0.062	-0.064	1.000		
FS	0.425	0.452	0.105	0.405	0.012	0.007	0.202	1.000	
GDPgrowth	0.001	0.035	0.073	0.045	0.091	0.090	0.058	0.037	1.000

Source: Calculated by the authors (STATA 13.0)

The strongest negative correlation of the dependent variable Short-term debt to total liabilities (STDTL) was recorded with the following independent variables: earnings before interest taxes depreciation and amortization (-0.567), then tangibility of assets (-0.561) and the current ratio (-0.528). Therefore, with the decrease in the balance sheet item of current assets (primarily referred to cash and cash equivalents), a number of companies within the power sector of Republika Srpska raise short-term loans with commercial banks to maintain their current liquidity. On the other hand, the following independent variables were recorded the same direction of movement with the dependent variable: firm size (0.425) and return on assets (0.221). Relatively larger companies (in terms of income, assets and possibly employees) will

borrow more loans from banks to finance their business than smaller companies that will finance their business mainly with equity and reduce the indebtedness due to certain restrictions imposed by commercial banks. It is also important to point out that larger companies can also use their assets as collateral, and that because of the length of their business, they have a greater reputation for granting loans from banks. Rajan and Zingales (1995), as well as Chittendan et al. (1996) also confirm in their research a positive relationship between company size and debt ratio.

The table 4 shows the results of the fixed effects regression (FE) between the selected variables in the model. The total number of observations is 220 which makes the models representative. The empirical value of the F test for 8 degrees of freedom in the numeration and 212 in the denomination was 42.84. The independent variables that showed the most significant correlation with the dependent variable in the model, that had a p-value of less than 5% were the following: tangibility of assets (0.000), current ratio (0.000) and firm size (0.032).

Table 4. Fixed effects regression between dependent and independent variables of the power sector of Republic Srpska for the period: 2008 – 2018

Fixed-effects (within) regression					**Number of obs = 220**	
R-sq: within =0.6200					Number of groups = 2	
between =0.000						
overall = 0.6200					Obs per group: min = 110	
avg =110 max = 110 F(8,212) = 42.84 Prob > F =0.0000						
STDTL (dependent)	**Coef.**	**Std. Err.**	**t**	**P>[t]**	**[95% Conf . Interval]**	
CR	-0.390	0.056	-6.90	0.000	-0.502	-0.279
ROCE	0.056	0.247	0.23	0.822	-0.433	0.544
EBITDA	-0.019	0.042	-0.45	0.653	-0.103	0.064
ROA	0.859	3.317	0.26	0.796	-5.678	7.398
ROE	-1.668	2.690	-0.62	0.536	-6.971	3.634
TOA	-0.583	0.055	-10.63	0.000	-0.691	-0.475
FS	1.046	0.485	2.16	0.032	0.089	2.003
GDPgrowth	0.016	0.023	0.71	0.480	-0.029	0.062
_cons	40.326	10.397	3.88	0.000	19.829	60.823
sigma_u	0.096					
sigma_e	4.768					
rho	0.0004					

Source: Calculated by the author (STATA 13.0)

There is also an inverse relationship between tangibility of assets and short-term debt to total liabilities (-0.583). The average value of fixed assets of a company within the power industry for the period: 2008-2018 was about 85% of total assets, given the nature of the business they are engaged in. Therefore, with the amortization of fixed assets due to the impact of depreciation, there is a need to modernize fixed assets from internal sources or external sources of financing. Given that, a large number of companies had a stable yield potential, then in the upcoming period they can base their financing needs on internal (accumulated) sources of financing.

Table 5. Random effects (GLS) regression between dependent and independent variables of the power sector of Republika Srpska for the period: 2008 – 2018

Random-effects GLS regression					**Number of obs = 220**	
R-sq: within =0.000					Number of groups = 2	
between = 0.000						
overall = 0.6200					Obs per group: min = 110	
avg = 110.0 max = 110.0 Wald chi2 (8)=344.23 Prob > chi2 = 0.000						
STDTL (dependent)	**Coef.**	**Std. Err.**	**z**	**P>[z]**	**[95% Conf . Interval]**	
CR	-0.390	0.056	-6.92	0.000	-0.501	-0.280
ROCE	0.056	0.247	0.23	0.820	-0.428	0.541
EBITDA	-0.019	0.042	-0.45	0.653	-0.101	0.064
ROA	0.859	3.309	0.26	0.795	-5.626	7.345
ROE	-1.667	2.684	-0.62	0.535	-6.927	3.593
TOA	-0.583	0.055	-10.65	0.000	-0.690	-0.475
FS	1.047	0.484	2.16	0.031	0.0981	1.996
GDPgrowth	0.015	0.022	0.68	0.497	-0.028	0.058
sigma_u	0.000					
sigma_e	4.768					
rho	0.000					

Source: Calculated by the author (STATA 13.0)

Based on the results of the GLS regression model, the following independent variables, with respect to p-values, had the strongest influence on the dependent variable, i.e., short-term debt to total liabilities: current ratio (0.000), tangibility of assets (0.000) and firm size (0.031). In terms of coefficient movements, the return on equity (ROE) had a negative correlation with short-term debt to total liabilities. The average value of the indicator return on assets of the power sector of Republika Srpska for the period 2008-2018 was about 0.17%, while the average value of the indicator return on equity was about 0.16%, which is at an extremely low level.

Table 6. Results obtained by application Breusch and Pagan Lagrangian multiplier test

Variables	**Var**	**Sd=sqrt(Var)**
STDTL	57.393	7.575
e	22.741	4.768
u	0.00	0.00

Source: Calculated by the author (STATA 13.0)

Given that the chi square value equal to zero, as p - value of certain independent variables is slightly higher than zero but less than 0.05 (such as: current ratio, the tangibility of assets and firm size), then it can be concluded that independent variables had an effect on the dependent variable, and confirm the hull hypothesis, and the alternative hypothesis for slightly higher significance.

CONCLUSION

A number of companies within the power industry of Republika Srpska entity have a stable and growing yield potential which creates the basis for higher debt capacity through corporate bond issuance and investments in new fixed asset infrastructure. The potential growth of companies within the Republika Srpska power industry can also have significant fiscal consequences given the contribution of the power industry to local and state budget revenues, etc.

The effect of the independent variables on the dependent variable using the Pooled OLS regression model (FE) model and the Random-effects GLS regression model by using the Breusch-Pagan Test was used. The most significant impact through the OLS regression model and GLS regression model had the following variables: current ratio, the tangibility of assets and firm size. Therefore, these three independent variables play a decisive role in composing the capital structure of the power sector of Republika Srpska, with particular emphasis on tangibility of assets due to the nature of the business and the great need to invest and replace dilapidated fixed assets. Also, this paper confirms both the null and alternative hypothesis with greater emphasis on the GLS regression model.

A number of companies in the power Industry of Republika Srpska are increasing their short-term indebtedness due to small amounts of cash and cash equivalents in the structure of total assets, and due to a fall in sales revenues in certain years of operation. In the upcoming period, the strategy of the power sector of Republika Srpska should be based primarily on reducing operating costs, building new energy facilities, and increasing business efficiency in order to achieve better business results. Also, the power industry of Republika Srpska has a stable and growing yield potential that creates the basis for higher debt capacity through corporate bond issuance and investments in new fixed asset infrastructure. Further research must test selection and inclusion of other independent variables as potential predictors of firms' capital structure within the power sector of Republika Srpska.

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