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Statistical analysis of causality between capital structure and firm profitability: Evidence from Bosnia and Herzegovina

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Abstract
This research is designed to examine the relationship between the capital structure and profitability of non-financial firms in Bosnia and Herzegovina during the ten years period, from 2003-2012. The goal is to prove the existence of the relationship between the firm's capital structure choice and its profitability. The analysis is extended by including the debt structure and differentiating between the types of debt such as the long-term and the short-term ones. Canonical correlation and multiple regression analysis are used. The results of the multivariate canonical correlation analysis provide support to a hypothesis that the capital structure and profitability have statistically significant relationships. Furthermore, the findings provide support that firms develop different patterns of profitability depending on the capital structure choice. We found that an increasing proportion of short-term debt and long-term debt in the overall liability of the firm reduces its profitability.

Keywords: capital structure, profitability, debt level, multivariate canonical correlation, multiple regression.

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Introduction
The modality of how firms make their debt-equity choice is one of the most researched issues in corporate finance. Financial leverage, as the extent to which the fixed-income securities (debt and preferred stock) are used in a firm' capital structure, concentrates the firm's business risk on its stakeholder. This concentration of

business risk occurs because the debt holders, who receive fixed interest payment, bear none of the business risk (Brigham, Daves, 2010). Nonetheless, many companies use debt to leverage their capital in order to increase profits. The companies increase their financial performance by using debt to finance the companies operation. The increase in companies' operation is expected to increase the net income. Consequently, the equity holder expected that by using more debt, it will increase the return on equity (ROE) (Brigham, Houston, 2007).The positive relation between financial leverage and operating risk has important implications for the firm's required rate of return. Specifically, to the extent that the additional operating risk resulting from debt financing is systematic, the expected rate of return for the firm should be increasing in financial leverage. But the effects of that action vary between companies. Good corporate governance shows the companies' performance on their use of debt to increase their profit (Maher, Anderson, 1999).

But these relationships vary according to the financing sources. Previous researches on the relationship between the capital structure and the performance of firms have produced mixed contradictory results. For example, Alemeida and Campello (2006) argue that there is a negative relationship between profitability and external financing, which includes debt capital. Oppositely, some other school of thought believes that more profitable firms should rely on external funds like debt to finance their investments. The reason is the tax shields advantage which they could derive from debt interest repayment (Graham, 2000). Based on previous empirical studies the main conclusion is that leverage can explain returns but the empirical relationship can be negative, positive, even weak or non-existent.

As compared to the developed markets like Europe, America etc. it is found by the Eldomiaty (2007) that capital markets are less efficient and suffers from higher level of asymmetry in terms of information in emerging and developing markets than capital markets in developed countries. The significance of the relation between the capital structure and firm performance is influenced by the country of origin of the firm (Krishnan, Moyer, 1997). Profitability is not only affected by the use of debt. Other internal (e.g. company size, operating decision) as external factors (industry type, taxes, interests and other macro factors) also affect the profitability of the companies. Results of some studies (Myers, 2001, Eldomiaty, 2007) showed that the capital structure is not the only way to explain financial decisions.

This study was designed to examine the relationship between the capital structure and profitability of non-financial firms, firms whose principal activity is the production of market goods or non-financial services, in the developing market economies like Bosnia and Herzegovina (BiH) during the period of ten years, from 2003-2012. We focused only on non-financial firms since they play a major role in the economic development of this country. The goal is to prove the existence of the relationship between the firm's capital structure choice and its profitability. The analysis is improved by including the debt structure, by differentiating between the types of debt such as long-term and short-term. As stated above, the crucial decision managers of non-financial firms face is the debt-equity choice. Among others, this choice is necessary for the profit determination of the firm. What this means is that firms that are able to make prudent choice between debt and equity would have a competitive advantage in the industry. All things being equal, this will maximize profit levels. Nonetheless, it is essential for us to recognize that this decision can only be wisely taken if and only the firms know how debt policy influences their profitability. To the best of the authors 'knowledge this research provides the first attempt to investigate if there is a relationship between the capital structure choice and corporate financial performance in BiH. This research has undoubtedly deepened

understanding of BiH firm's profitability. The paper consists of five parts, including the introduction. The second part lays out the theoretical explanation of the relation between leverage and profitability. Part three is dedicated to the research methodology and data, while part four contains the findings and discussion. The conclusions, limitations of the research and direction for future research are presented in the last section.

Explaining the Relation between Leverage and Profitability

When the Modigliani and Miller (MM), Nobel Prize winning financial economists, published their seminal paper in 1958, they argue that the capital structure is irrelevant under stringent conditions, including the assumption of no taxes, because it has no effect on either the WACC (weighted average cost of capital) or the value of a firm (Modigliani, Miller, 1958). Any increase in ROE resulting from financial leverage is exactly offset by the increase in risk, (i.e. cost of equity), so WACC is constant. In other words, there is no relationship between the level of debt and performances.

But, when they in added in corporate taxes (Modigliani, Miller, 1963), their model leads to the conclusion that a firm's cost of capital is minimized and its value maximized, at 100% debt. With corporate taxes, the benefits of financial leverage exceed the risk because more EBIT (earnings before interest and taxes) goes to investors and less to taxes when leverage is used. This indicates a positive relationship between the debt level and firm's performance. In other words, an increase in financial leverage would lead to a higher stock return, all else being equal. An increase in financial leverage may also decrease the equity values if it increases the operating risk of the firm. This is a basic concept in finance, where equity risk is formed by two fundamental risks: operating risk and financing risk. Given the operating risk, the average returns are increasing with leverage. It implies that financial leverage intensify the exposure of equities to priced systematic risks. In MM, the leverage is related to returns only because it increases equity betas; the leverage does not have an independent effect on returns. This theory ignores bankruptcy costs, which increase as more leverage is used.

But, many empirical research work record that raw returns have a negative, or at least flat, relation with financial leverage, and that returns adjusted by traditional sources of risks have an even stronger negative relation with leverage. These findings are usually enigmatic. However, it is possible that market frictions lead low leverage firms to have greater exposures to systematic risks. For instance, companies might optimally choose low leverage in response to greater exposure to systematic risks. Then, the reinforcement effect of leverage on equity risk could be either diminished or prevail (George, Hwang, 2009). Hence, identifying the economic sources of risk that justify the empirical evidence concerning the relation between the leverage and profitability is an important issue and can help understand firms' financial decisions (Muradoglu, Sivaprasad, 2010).

Methodology

For the purpose of this study we have chosen to measure the capital structure by the debt-to-capital ratio. It measures part of a company's capital (debt plus equity) represented by debt. Depending on two different definitions of debt, leverage was measured by two variables (Welch, 2011): the financial-debt-to-capital ratio (financial leverage) that does not consider non-financial liabilities as debt (PSC1), and the total-liabilities-to assets ratio (balance sheet leverage) that treats financial and non-financial liabilities alike (PSC3).

This study investigates do capital structure decision really matters when it comes to profitability on case of Federation BiH (FBiH). Therefore, the empirical method is designated to examine the relationship between capital structure choice and profitability of the firms under study as direction and intensity of that relationship, simultaneously taking into account the debt structure. The first one was assessed by applying the canonical correlation analysis and the latter one by using factor analysis and multiple regressions. We used STATA and SPSS 17 software for data analysis.

The purpose of the canonical correlation analysis is to determine if a significant linear relationship exists between two constructs (capital structure and profitability), each represented by the set of variables that measure similar constructs, and if a relationship exists, how the two sets relate to each other. The capital structure variables are labelled as *SET 1* and are represented by two debt-to-capital ratios which are further divided by debt structure into short and long-term component. The profitability variables are labelled as *SET 2* and are represented by five ratios: Net profit margin (sales), Net profit margin (total revenue), ROTA (return-on-total assets), ROA (return-on-assets), ROE (return on equity).

In canonical correlation, there are several variables on both sides and there may be several ways to recombine the variables on both sides to relate them to each other (Figure 1 and Figure 2). Usually only the first two or three combinations are statistically significant and need to be interpreted (Tabachnick, Fidell, 2013). The canonical analysis may is exploratory technique that does not imply a causal relationship and therefore does not inform nothing on the direction of that relationship.

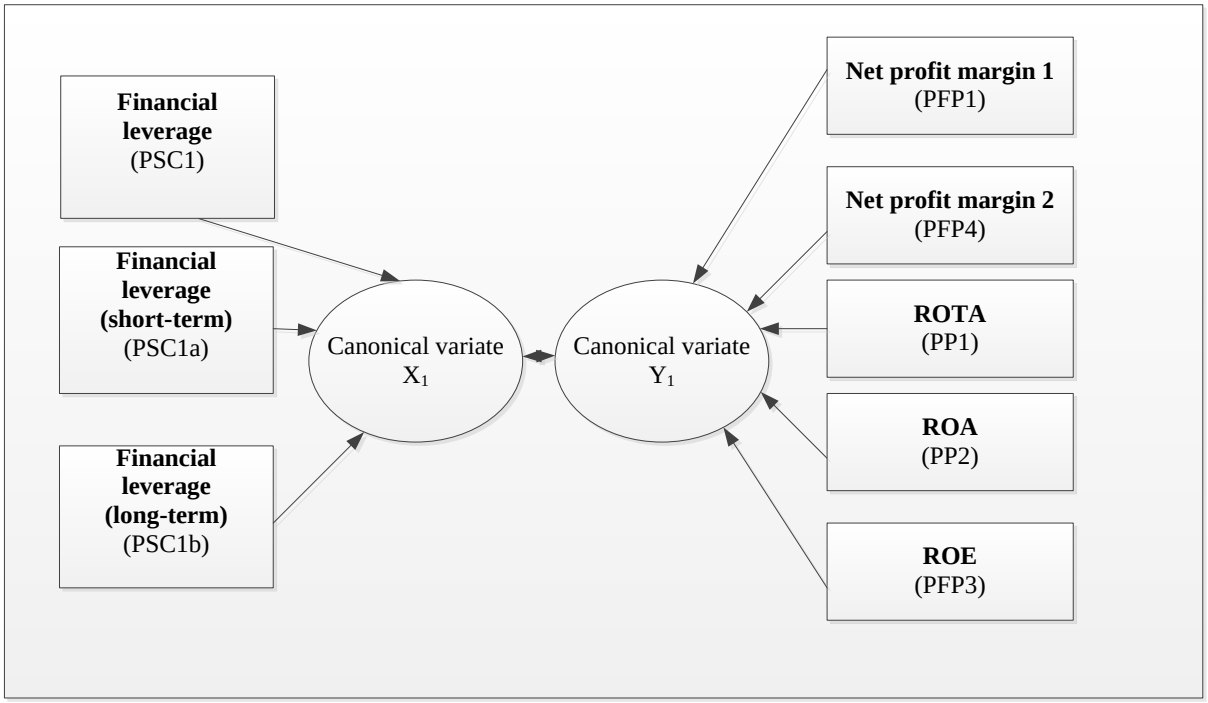

Figure 1 Canonical Model - First Capital Structure Model

Source: author's research.

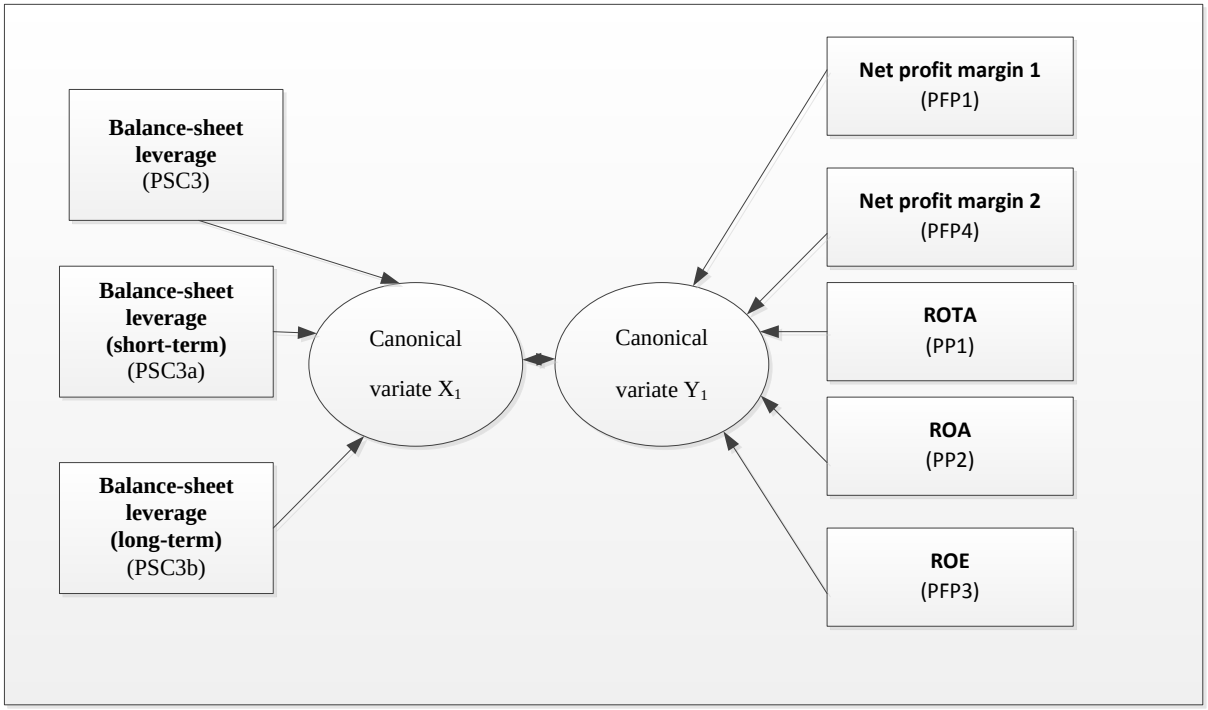

Figure 2 Canonical Model - Second Capital Structure Model
Source: author's research.

Therefore we applied the multiple regressions. In the multiple regressions, the same thing happens except that there are several independent variables on the one side of the equation and one dependent variable on the other side. The combination of variables can be thought of as a dimension among the several variables that predicts the dependent variable. We choose to see a model where the profitability plays a role of the dependent variable:

$$\text{Measure for profitability}_i = a + b_{11}\text{*Short – term Debt Ratio(for financial leverage)}_i + b_{12}\text{*Long – term Debt Ratio(for financial leverage)}_i + e_i, \quad (1)$$

$$\text{Measure for profitability}_i = a + b_{21}\text{*Short – term Debt Ratio(for balance – sheet leverage)}_i + b_{22}\text{*Long – term Debt Ratio(for balance – sheet leverage)}_i + e_i. \quad (2)$$

There are two models with short-term and long-term debt ratio like independent variables, but leverage is different: financial and balance-sheet).

Results and discussion

The data are collected for period of 10 years (from 2003 to 2012) using the AFIP (Agency for the Financial, IT and Intermediary Services) dataset that maintains a comprehensive financial database of all companies operating in the FBiH. The canonical correlations are calculated for each year and for overall data collection. Total number of observation is 140.766 coming from 14 industries.

Overall, the first canonical correlation explains about 8.5% of relationships between profitability and the first capital structure model, while the second capital structure model explains 48.34% of the relationships that is much higher. Both canonical correlations are statistically significant, however, for the first capital structure model it is practically irrelevant and probably product of high number of observations. First canonical correlation between profitability and the first capital structure model explains between 5% and 15% in the period of 2003 and 2012, if analysed separately. Data mostly shows a trend in increase in canonical correlation

value over the years with 14% being explained in 2012. The first canonical correlation between profitability and the second capital structure model shows higher correlations than with the first capital structure model and total explained variance varying from 45% to 55% over the years with 46% explained in 2012. At the level of all companies observed over the years all canonical correlations are statistically significant.

The correlation within the capital structure variables shows that there are high correlations between total and short-term debt in both models (0.74 to 0.84 in Model I; 0.85 to 0.91 in Model II), while the correlations between total and long-term debt (0.46 to 0.65) is medium in size in Model I and very low in Model II (0.06 to 0.22). Correlations between the short-term and long-term debt (0.02 to 0.17) are low in both models, however in Model II these correlations are somewhat higher and reflect negative relationships (-0.15 to -0.28). Over the years, there has been an average flat rate in the increase of correlations between the total and short-term debt in both models, the correlations between total and long-term debt are increasing over the years in both models, while the correlations between the short-term and long-term debt increase in Model I and decrease in Model II.

As both Models contain the same sets of performance variables, the correlations matrix is the same for both Models. The correlations between ROTA, ROA, Net profit margin (Sales) and ROE are moderately high (0.62 to 0.99) with the increase trend over the observed years. Correlations among ROA, Net profit margin (Sales), ROE and Net profit margin (Revenue) are very high and indicate possible multicollinearity problems (above 0.90).Correlations between the capital structure and profitability variables are small and in Model I do not exceed 0.1 while in Model II do not exceed 0.23. The data shows a good convergent and discriminative validity.

Three canonical variates are extracted in both examined models. All three canonical variates are statistically significant in Model II, while in Model I first two canonical variates are statistically significant over the years, but third canonical variate is statistically significant during the half of the observed period, without clear tendency. Canonical correlations between first canonical variates are higher in Model II (0.58 to 0.74) in comparison with Model I (0.22 to 0.38), indicating that Model II provides better description of company profitability based on capital structure.

Canonical cross loadings between the capital structure variables and canonical variates of profitability indicate a low relationship within Model I (loadings between 0.01 and 0.34) while in Model II, canonical loadings are consistently high over the years and vary from 0.66 to 0.73 for total debt and 0.58 to 0.64 for short-term debt. Long-term debts do not have high loadings with canonical variate 1 of company's profitability. All relationships are negative, indicating that a higher canonical variate results in profitability of companies with a lower total and short-term debt.

The first canonical variate of company's Profitability has general low loadings with profitability proxies in Model I (0.00 to 0.91), and somewhat higher loadings within the Model II (0.01 to 0.22). Over the years, there is a general trend of increasing relationships between the first canonical variate and profitability indicators in Model II, while in Model I the trend is flat. In both models the higher results in First canonical variate have companies with low ROE (contributing the most to the total score of canonical variate) and the higher remaining profitability indicators (for some years some indicators have loading lower than 0.1, but in most of years it is over 0.2).

High second canonical variate is in companies with lower ROTA, higher ROA and higher ROE. A high third canonical variate is in companies with low results on all five Profitability indicators. Interpretation of the second and the third canonical variates are consistent over the years and canonical variates of profitability in Model II have

similar interpretation as in Model I. Canonical cross loadings between profitability proxies and canonical variates of company capital structure indicate a low relationship within both tested Models. Cross loadings are somewhat higher in Model II (0.01 to 0.22) in comparison with Model I (0.01 to 0.09).

The first canonical variate of capital structure explains a high proportion of variance of the capital structure proxies in both models (0.31 to 0.44 with the trend of increase over the years).While the first canonical variate of company's profitability explains low proportion of the capital structure variance Model II (0.03 to 0.07) and Model I (0.002 to 0.007). During some years, the explained variance grows. However, the growth is not consistent in time (contributed by third canonical variate only).

The performed canonical analysis provides us with the information on the existence of the relationship between profitability and the capital structure. However, we used multiple regressions, in order to get an accurate picture of the direction and the intensity of that relationship, when we looked at the profitability as a dependent and the capital structure as an independent variable. Since we have five measures of profitability, the first step was a factor analysis to unify all those measures into a single factor (the first factor, which in the rotated factor model represents a 38.89% of the total variability) whose factor scores are used as a dependent variable for profitability.

Furthermore, this paper employed different measures of capital structure in terms of debt maturity, such as short-term debt and long-term debt, in order to investigate the effect of the debt structure on corporate performance. Investigating the effect of the capital structure on corporate performance using two accounting measures is also valuable as it provides evidence about whether the non-financial debt is important or not. Therefore, the dependent variable was the factor scores for profitability while long-term and short-term component of the capital structure are taken as independent variables (Table 1).

Table 1 Multiple Regressions - Factor Scores for Profitability (as Dependent Variable)

Factor scores for profitability				
Model		R	**b**	p
Financial leverage	Short-term Debt Ratio	0.012 (p=0.000)	**0.024**	0.026
	Long-term Debt Ratio		**-.050**	0.000
Balance-sheet leverage	Short-term Debt Ratio	0.054 (p=0.000)	**-.022**	0.000
	Long-term Debt Ratio		**-.071**	0.000

Source: author's research.

When we look at leverage only in financial terms, the regression results showed that coefficient b is positive and p value is lower than 0.05, what indicate a significantly positive relationship between the short-term debt ratio and profitability. At the same time, there is a negative relationship between the long-term debt ratio and profitability (coefficient b is negative and p value is lower than 0.05). This implies that, during the period under study, the long-term financial leverage did not bring about profitability. Then the multiple regression models were created with the same independent variables, but the individual measures of profitability are taken as a dependent variable (Tables 2 – 6).

Table 2 Multiple Regressions - Net Profit Margin 1 (as Dependent Variable)

Net profit margin 1				
Model		R	**b**	p
Financial leverage	Short-term Debt Ratio	0.101 (p=0.000)	**-.094**	0.000
	Long-term Debt Ratio		**-.053**	0.000
Balance-sheet leverage	Short-term Debt Ratio	0.266 (p=0.000)	**-.286**	0.000
	Long-term Debt Ratio		**-.086**	0.000

Source: author's research.

Table 3 Multiple Regressions - Net Profit Margin 2 (as Dependent Variable)

Net profit margin 2				
Model		R	**b**	p
Financial leverage	Short-term Debt Ratio	0.096 (p=0.000)	**-.093**	0.000
	Long-term Debt Ratio		**-.042**	0.000
Balance-sheet leverage	Short-term Debt Ratio	0.265 (p=0.000)	**-.282**	0.000
	Long-term Debt Ratio		**-.076**	0.000

Source: author's research.

Table 4 Multiple Regressions - ROTA (as Dependent Variable)

ROTA				
Model		R	**b**	p
Financial leverage	Short-term Debt Ratio	0.064 (p=0.000)	**-.061**	0.000
	Long-term Debt Ratio		**0.037**	0.000
Balance-sheet leverage	Short-term Debt Ratio	0.278 (p=0.000)	**-.279**	0.000
	Long-term Debt Ratio		0.001	0.973

Source: author's research.

Table 5 Multiple Regressions - ROA (as Dependent Variable)

ROA				
Model		R	**b**	p
Financial leverage	Short-term Debt Ratio	0.101 (p=0.000)	**-.094**	0.000
	Long-term Debt Ratio		**-.053**	0.000
Balance-sheet leverage	Short-term Debt Ratio	0.294 (p=0.000)	**-.276**	0.000
	Long-term Debt Ratio		**-.078**	0.000

Source: author's research.

Table 6 Multiple Regressions - ROE (as Dependent Variable)

ROE				
Model		R	**b**	p
Financial leverage	Short-term Debt Ratio	0.069 (p=0.000)	**0.079**	0.000
	Long-term Debt Ratio		-.002	0.590
Balance-sheet leverage	Short-term Debt Ratio	0.144 (p=0.000)	**0.165**	0.000
	Long-term Debt Ratio		**0.041**	0.000

Source: author's research.

When looking at the coefficient of determination (squared R value from tables), the profitability ratios have the following ascending order: ROA, Net Profit Margin 1, Net Profit Margin 2, ROTA, ROE. The first three measures show the same pattern in terms of their relationship with the capital structure choice. For both accounting measures, there is a significantly negative relationship between the short and the long-term debt ratios and profitability. This presupposes that as the leverage increases, the profitability expressed through ROA, Net Profit Margin (Sales), Net Profit Margin (Revenue) decreases. This implies that firms should rather consider internal sources of finance rather than external borrowings, if they want to enhance their profitability. ROTA and ROE showed contraversary results and they were not all significantly related. Concerning the relationship between ROTA and short-term debt ratio, it was found that ROTA was negatively and significantly related to short-term debt ratio ($b_{ROTA,11}$=–0.061, $p_{ROTA,11}$<0.05, $b_{ROTA,21}$=–0.279, $p_{ROTA,21}$<0.05). At the same time, it was positevely and significantly related to the long-term financial debt ratio ($b_{ROTA,12}$=0.037, $p_{ROTA,12}$<0.05) and positively but insignificantly related to the long-term balance sheet ratio ($b_{ROTA,22}$=0.001, $p_{ROTA,22}$>0.05). The results also shows that the ROE was positively and significanlty related to the short-term debt ratio for both capital structure measures ($b_{ROE,11}$=0.079, $p_{ROE,11}$<0.05, $b_{ROE,21}$=0.165, $p_{ROE,21}$<0.05) and therefore increasing the short-term debt will lead to increase in profitability. In terms of long-term debt ratio, ROE was negatively and insignificantly related to the long-term financial debt ratio ($b_{ROE,12}$=-0.002, $p_{ROE,12}$>0.05), but positively and significantly related to the long-term balance-sheet debt ratio ($b_{ROE,22}$=0.041, $p_{ROE,22}$<0.05).

Conclusions

Though three canonical variates are statistically significant in the explanation of relationships between profitability and leverage, but only the first canonical variate explains the practically usable size of variance of both profitability and leverage. Obviously, the canonical correlations between the first canonical variates are higher in Model II in comparison with Model I, indicating that Model II provides better description of company profitability based on capital structure. Both canonical correlations are statistically significant, however, for the first capital structure Model it is practically irrelevant and probably product of a high number of observations. Therefore, we take into consideration only the interpretation of the Model II that indicates the companies should preferably decrease their short term debt financing as it lowers firm's financial performance. Analysis of relationships between canonical variates of the capital structure and profitability also revealed that a much better relationship is explained when observing the canonical variates in comparison with correlations between the capital structure and profitability proxies

The results of the multivariate canonical correlation analysis provide support to the hypotheses that the capital structure and profitability have statistically significant relationships. Furthermore, the findings provide support that firms develop different patterns of profitability depending on the capital structure. Finding of the research

indicate that there are three statistically significant structures of relationships (combinations of relationships) between profitability and the capital structure.

The following relationships between profitability and the capital structure are found: the companies with a lower total debt and short term debt are more likely to have a lower ROE while retaining other's profitability indicators on a higher level. This can be also be interpreted vice versa and is applicable to both models. In Model I, the companies with a lower total debt, the short term debt and long term debt are more likely to have a lower ROTA, higher ROA and ROE, while in Model II, the companies with a lower long term debt and higher values of short term debt are more likely to have lower ROTA, higher ROA and ROE. In Model I, the companies with a lower total and short term debt, but higher long term debt are more likely to have lower results on all five profitability indicators, while in Model II the companies with higher total, short and long term debt are more likely to have lower results on all five profitability indicators. Interpretations are consistent over the years.

The conducted canonical analysis does not ensure causality interpretation, but one can argue that the capital structure comes before gaining profitability in the establishment of the company and therefore, the causality relationships can be expected. We performed the multiple regressions where a dependent variable is the profitability and independent variables are from the capital structure. The dominance of the short-term debt is evident whereby the measures of profitability cannot be used interchangeably. When looking at the coefficient of determination, the profitability ratios have the following ascending order: ROA, Net Profit Margin 1, Net Profit Margin 2, ROTA, ROE. This finding can help a stakeholder to choose the appropriate measure of profitability to evaluate and analze the firm's financial status.

This study has several limitations. There is a criticism that the firm-level financial data collected by the government agency tend to be inaccurate because of firms underreporting and misreporting their true financial position to government authorities to avoid taxation and government interference. However, in BiH datasets collected by the government are the only available source of firms' financial data. In terms of assessing the link between the profitability and the leverage, the key limitation is that we neglected other factors that can affect profitability. Isolation and observation of interdependence of only two variables, although in theory possible, is rather simplified view of the practice. Especially if one of these variables is profitability, which is influenced, besides the capital structure, by a number of factors, both internal and external, such as the firm size, age, growth, risk, tax rate and factors specific to the sector of economic activity and macroeconomic environment of the country. Recommendation for future research would be to include a larger number of variables that affect profitability in order to accurately and precisely detect the relationship between financial leverage and profitability.

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