The Importance of Estimation Method Choice for the Analysis of the Determinants of Capital Structure– An Example of Poland

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Abstract

The results of the analysis of capital structure determinants are affected by three main aspects of the study. Firstly, the researcher has to select the set of determinants taken into account. Secondly, the influence of these determinants may vary depending on their operationalization. Thirdly, the estimated parameters of the regression model and the significance of selected determinants may differ between the estimation methods. Taking into consideration the characteristics of capital structure data, i.e. the persistence of debt ratios, the endogeneity of independent variables and two-dimensional residuals, the determinants of debt ratios should be analyzed with dynamic panel data models, using generalized method of moments estimators. . For the companies listed on Warsaw Stock Exchange, it is shown that both parameter and their standard errors estimates vary significantly when the model is estimated with ordinary least squares, fixed effects or generalized method of moments. The results imply that lagged debt ratio and size have positive impact on debt ratio, while profitability, business risk and industry median debt ratio have negative impact on debt ratio for companies listed on Warsaw Stock Exchange.

Keywords: Capital structure, debt ratio, generalized method of moments
JEL Codes: J3, J32

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1. INTRODUCTION

Although the decisions considering capital structure of the companies are very complex, they are one of the most important financial decisions affecting the performance of the company. Therefore it is important for the researchers to understand the mechanics of capital structure and its determinants. There are two principal theories explaining which factors may influence the choice of financing sources: the pecking order theory and the trade-off theory.

The static pecking order theory, introduced by [34] and [32], claims that there is a strict preference between the financing sources. Internal sources are the first being used, and afterwards the company turns to external sources. When it comes to the latter, additional debt is preferred, while increase in stockholders' equity is considered as a last resort. The capital structure can be therefore viewed as a result of previous decisions concerning the choice of financing sources [42]. In the dynamic version of pecking order theory, it is possible for the preferences stated above to change depending on the situation on capital markets and valuation of the company [29].

According to the trade-off theory, a company has an optimal capital structure, which balances the positive and negative influence of debt on the value of the company [22]. Among the advantages of debt, the most important is tax shield, which increases profitability and value of the company. However, increasing debt may lead to higher costs of financial distress, i.e. direct and indirect costs of bankruptcy, lack of financial elasticity or the necessity to cut the dividends [17]. In the static trade-off theory, the target capital structure of the company is fixed, while the deviations from this target are only temporary [33]. In the dynamic version of the theory, the target itself may vary due to changes in company's financial situation, therefore the deviations from the target may be observed for longer periods of time [27].

The rest of the paper is structured as follows. In section 2. there are presented the main factors influencing capital structure of the companies, identified on the basis of both theoretical and empirical research. Section 3. expands on the assumptions of estimation methods used for capital structure models, as well as consequences of their violations. In section 4. The data set is described. Section 5. focuses on the estimates of regression models explaining debt ratios of companies listed on Warsaw Stock Exchange, together with the discussion of the results. The last section concludes.

2. DETERMINANTS OF CAPITAL STRUCTURE

The capital structure theories described above differ not only in the set of factors which influences the capital structure, but also in the direction of this influence. According to the pecking order theory, tangibility of assets, profitability, liquidity and business risk should have negative influence on the amount of debt used by the company, whereas the influence of growth possibilities, size and payment of dividends should be positive [31]. The static trade-off theory disagrees when it comes to tangibility, profitability and liquidity (positive influence), while the influence of growth possibilities should be negative. Both theories agree on the impact of size and business risk. Moreover, the static trade-off theory predicts that the company uses more debt when it faces higher tax rate, when its products are less unique and when it has lower value of non-debt tax shield [31].

Considering the results of the empirical research conducted in the field of capital structure determinants, there is consensus concerning neither the set of the factors, not the direction of their impact on companies' debt ratios. Taking into account selected studies presented in Table 1., the most often included capital structure determinants are: profitability, growth possibilities, size, tangibility of assets, industry, non-debt tax shield, R&D expenditures and business risk. Moreover, several studies analyzed also the impact of such factors as: dividend payments [2, 26, 28], tax rate [2, 10, 22, 41], liquidity [10, 19, 37], financial deficit [9, 39], equity rates of return [2, 19, 39], cost of sales [21, 24, 27] and rating of company's debt [8, 16].

Most of the studies start from the set of determinants analyzed by Rajan and Zingales [38], who included growth possibilities, profitability, tangibility and size. A broader set of factors was analyzed by Harris and Raviv [20], who considered also non-debt tax shields, investment opportunities, earnings volatility, default risk, advertising expenditures, R&D expenditures, and product uniqueness. A thorough examination of factors suggested by the previous research was conducted by Frank and Goyal [17], who concluded that apart from the determinants suggested by Rajan and Zingales [38], median industry debt ratio and expected inflation should be also taken into account.

Table 1: Capital structure determinants described in selected empirical research

Factor	**Selected empirical research**
profitability	[7], [9], [10], [12], [13], [14], [16], [17], [21], [22], [24], [25], [28], [30], [37]
growth possibilities	[7], [9], [10], [12], [14], [16], [17], [21], [24], [25], [27], [28], [30], [37]
size	[7], [9], [10], [13], [14], [16], [17], [21], [22], [24], [25], [27], [28], [30], [37]
tangibility of assets	[7], [9], [10], [13], [14], [16], [17], [21], [22], [24], [25], [27], [28], [37]
industry	[14], [16], [21], [24], [27], [28], [37]

Factor	**Selected empirical research**
non-debt tax shield	[9], [13], [14], [16], [25], [27], [37]
R&D expenditures	[7], [14], [16], [21], [22], [24], [37]
business risk	[10], [27], [28], [30]

Inconsistent results of previous empirical studies result from differences in several aspects of research plan. Firstly, researchers take into account varying set of factors used as determinants of debt ratios. Secondly, the factors in question are operationalized by various measures. Thirdly, the magnitude and direction of the influence of selected factors on companies' debt ratios may differ depending on the estimation method chosen by the researchers. As far as determinants and its measures are concerned, a review can be found in [17]. Concerning estimation methods used to assess the importance of the determinants, among the most popular are ordinary least squares estimator (OLS) [10, 12, 14, 17, 21, 24] and fixed effects method (FE) [12, 13, 16, 22, 25, 28]. More advanced approaches are generalized methods of moments estimators (GMM), in particular Arellano-Bond (1991) estimator [e.g. 12, 25], Blundell-Bond (1998) estimator [e.g. 28] and Hahn et al. (2007) estimator [e.g. 22]. More detailed description of the methods listed above can be found in section 3.

Influence of the selected determinants of capital structure is assessed on the basis of panel data, where time dimension is significantly smaller than the number of companies. Moreover, debt ratios are characterized by high persistency, i.e. its current realizations are highly correlated with past ones [40, 44]. As far as independent variables are concerned, the factors describing the situation of the company are not strictly exogenous, i.e. they may be correlated with past and current realizations of residuals [40, 44]. Such properties of the data indicate that regression models explaining the companies' debt ratios may suffer from severe biases, resulting in unreliable estimates of both parameters and their standard errors.

Taking the above into consideration, not only the choice of capital structure determinants, but also the choice of estimation method for regression model alters the conclusions of the research concerning which factors have significant impact on companies' debt ratios.

3. ESTIMATION METHODS USED FOR CAPITAL STRUCTURE RESEARCH

Given the characteristics of the debt ratios and their determinants described above, the relation in question should be analyzed with dynamic panel data models [3]. The estimators for these models are designed to deal with the issues of endogeneity, persistence of dependent variable and two-dimensional residuals (by time and by companies) [5]. These are, among others, Arellano-Bond (1991) estimator (called “difference GMM”, GMM-DIFF), Blundel-Bond (1998) estimator (called “system GMM”, GMM-SYS) and Hahn et al. (2007) estimator (called “long-differencing estimator”, LD).

When estimating the regression models explaining debt ratios with OLS method, the standard error estimates are biased due to two-dimensional residuals [5]. Moreover, the parameter estimates themselves are biased and inconsistent due to correlation between lagged dependent variable (used as a regressor in dynamic models) and the residuals [5]. OLS method does not account for fixed effects for the companies [3]. Moreover, OLS requires strict exogeneity of independent variables, which is not true for capital structure determinants [3].

In comparison to OLS, FE estimators take into account the two-dimensional residuals, as well as fixed effects for the companies [5]. It results in consistent estimates for independent variables, however the parameter estimates for lagged dependent variable and for fixed effects remain biased [5]. As a consequence, the FE Within estimator is biased, and its consistency depends on large time dimension of the data [35].

Although both OLS and FE estimators are biased for dynamic panel data, the direction of their bias is opposite. OLS parameter estimates are lower than true parameters, while FE parameter estimates are higher than their true values [3, 44]. More accurate estimates can be obtained by using GMM-DIFF and GMM-SYS. Both of these estimators are generalized method of moments (GMM) estimators, which use instrumental variables (IV) method. IV method requires identifying a set of variables, called instruments, which are highly correlated with independent variables, but uncorrelated with the residuals [23]. By eliminating the correlation between dependent variables and residuals, the regression estimates become consistent. As far as GMM estimator is concerned, its parameter estimates are calculated by equating theoretical moments with their empirical counterparts or estimates [23]. Contrary to the maximum likelihood method of estimation, GMM method does not require the distribution function of the data to be known.

Both GMM-DIFF and GMM-SYS estimators are based on the assumption that there are no external instruments available [5]. Arellano and Bond [4] suggested that after first-differencing the equation and eliminating fixed effects, levels of the explanatory variables can be used as instruments for GMM. It has to be noted, however, that such a transformation aggravates the problem of missing data. One of the solutions is to use forward orthogonal deviations transformation (FOD), i.e. to calculate the differences between current value of the variable and average future values of this variable [40]. Another modification, introduced by Blundell and Bond [6], was to use first differences of variables as instruments for their levels. As a consequence, GMM-SYS is based on both levels and first differences as dependent variables [40]. Then it is possible to include time-invariant variables and use more of the information from the data.

For OLS estimates to be valid, it is necessary to ensure that residuals are uncorrelated, homoscedastic and have normal distribution. GMM estimators do not require these assumptions to hold [44]. However, crucial for both GMM-DIFF and GMM-SYS is lack of autocorrelation of second order and higher of residuals (after elimination of fixed effects) [40]. Moreover, GMM estimates are highly dependent on the quality of the instruments [5]. Weak instruments may result in biased estimates, especially if full set of moments is used and their number is high compared to the number of analyzed individuals or companies. The problem of weak instruments is more pronounced for GMM-DIFF estimator, for shorter panels and more persistent data [3].

The GMM assumptions are verified by two tests: Arellano-Bond test of second order autocorrelation and Sargan test of instruments' validity [5]. The former test's null hypothesis is lack of serial correlation between first differences of the residuals and their values lagged by two periods. The latter test is used to check for joint validity of overidentifying moment conditions. The Sargan test has a tendency to reject the null hypothesis when residuals are heteroskedastic, and its robust variant is Hansen test [40].

GMM methods may seem like a remedy for all the problems of data on capital structure and its determinants. However it has to be underlined that GMM-DIFF and GMM-SYS are complicated, thus they easily generate invalid estimates [40]. Moreover, asymptotic qualities of the estimators are not a good predictor of their characteristics in finite-sample models [1]. It is though possible to check the estimators by using simulated data, based on real capital structure data. Such a study was conducted by, for example, [15]. The authors concluded that estimation with GMM- SYS results in reliable parameter estimates regardless of the endogeneity or persistence observed in the sample. GMM-SYS estimator proved to be better than OLS, FE, GMM-DIFF and LD. It should be noted that LD estimator, which was supposed to lower the severity of weak instruments problem in GMM [18], generated 5-fold increase in standard errors when the data were highly persistent [15].

Biased results of OLS estimation are also confirmed by empirical studies based on real data [11, 36]. Another finding is that GMM-DIFF estimates of parameter variance are higher than for GMM-SYS [11, 36]. Considering the properties of the data on debt ratios and their determinants, the assumptions of OLS and FE estimators are highly unlikely to be met. As far as GMM methods are concerned, GMM-SYS parameter estimates can be more reliable than GMM-DIFF estimates. However it has to be stressed that due to the complexity of GMM methods, more than one GMM model should be estimated to compare the obtained estimates [5].Moreover, it is possible to assess the influence of selected factors on debt ratios only if the models' assumptions are met.

4. DATA AND METHODOLOGY

The aim of this study is to analyze the influence of selected factors on debt ratios of companies listed on Warsaw Stock Exchange.

The sample consists in companies listed in continuous system trading in 2002-2015. The financial data of the companies are taken from Notoria Serwis Database. Taking into consideration the nature of companies' sources of financing, the following industries are excluded from the sample: banking, insurance, other financial, capital market and conglomerates. Moreover, in order to guarantee the comparability of the data, the companies whose shares trade in currency other than PLN are excluded. There are 3 079 observations included in the sample.

The dependent variable in the study is total debt ratio, defined as ratio of book value of total liabilities to the sum of book value of total liabilities and market value of equity. The market debt ratio was chosen instead of book debt ratio due to its forward-looking character and proximity to internal value of the company [41, 43].

As far as capital structure determinants are concerned, the study focuses on the following factors: profitability, size, growth possibilities, tangibility of assets, business risk and industry classification. Profitability is measured with ratio of earnings before interest, taxes, depreciation and amortization (EBITDA) to total assets [e.g. 7, 9, 24, 39]. Size of the company is measured by natural logarithm of total assets [e.g. 12, 14, 25, 30, 37]. Growth possibilities are measured by ratio of market value of equity to book value of equity [e.g. 7, 12, 14, 30, 37]. Tangibility of assets is measured as ratio of sum of property, plant and equipment and inventory to total assets [e.g. 17]. Business risk is measured as standard deviation of ratio of operating cash flows to total assets, calculated over 3-year period [e.g. 30]. Industry classification is included in the model by industry median debt ratio as one of independent variables [e.g. 14, 17, 28, 37, 39].

The impact of profitability, growth possibilities, tangibility of assets, business risk and industry classification on debt ratios is measured by multiple regression model. The explanatory variables are lagged by one period and include lagged dependent variable. As a consequence, the regression model has the following form:

$$y_{it} = b_0 \times y_{i,t-1} + b_1 \times x_{1,i,t-1} + b_2 \times x_{2,i,t-1} + b_3 \times x_{3,i,t-1} + b_4 \times x_{4,i,t-1} + b_5 \times x_{5,i,t-1} + b_6 \times x_{6,i,t-1} + b_7 + \varepsilon_{i,t}$$

where: y – total debt ratio, x_1 – profitability, x_2 – size, x_3 – growth possibilities, x_4 – tangibility of assets, x_5 – business risk, x_6 – industry median debt ratio, b_0 – b_7 – parameter estimates, ε – residuals.

5. RESULTS AND DISCUSSION

Parameter estimates and their standard errors (in italics) for different estimation methods are presented in Table 2. Model estimated with OLS accounts for possible heteroskedasticity. Robust standard errors are also used with FE estimation. For GMM methods, all possible lags of explanatory variables are included in the model, with robust standard errors and FOD transformation for both GMM-DIFF and GMM-SYS models.

Table 2: Parameter estimates of OLS, FE, GMM-DIFF and GMM-SYS models

variable	OLS	FE	GMM-DIFF	GMM-SYS
debt ratio	0.7690 *0.0162*	0.4137 *0.0241*	0.3787 *0.0474*	0.6847 *0.0347*
profitability	-0.1157 *0.0264*	-0.1178 *0.0166*	-0.0589 *0.0244*	-0.1257 *0.0247*
size	0.0095 *0.0017*	0.0663 *0.0075*	0.0978 *0.0108*	0.0218 *0.0051*
growth possibilities	-0.0000 *0.0002*	-0.0002 *0.0004*	-0.0002 *0.0006*	-0.0005 *0.0005*
tangibility of assets	-0.0120 *0.0117*	0.0269 *0.0370*	-0.0027 *0.0573*	-0.0453 *0.0308*
business risk	-0.0097 *0.0273*	-0.0111 *0.0420*	-0.0289 *0.0629*	-0.0620 *0.0294*
industry median debt ratio	-0.1212 *0.0227*	-0.1145 *0.0286*	-0.1395 *0.0457*	-0.1793 *0.0358*
constant	0.0634 *0.0213*	-0.5100 *0.0975*		-0.0077 *0.0638*
N	3079	3079	2653	3079
number of instruments			534	618
Arellano-Bond test for AR(1)			-8.23 (0.000)	-10.46 (0,000)
Arellano-Bond test for AR(2)			-4.67 (0.000)	-4.63 (0.000)
Arellano-Bond test for AR(3)			6,13 (0.000)	7.06 (0.000)
Arellano-Bond test for AR(4)			-0.36 (0.722)	-0.39 (0.699)
Sargan test			979.52	1 389.99

variable	OLS	FE	GMM-DIFF	GMM-SYS
			(0.000)	(0.000)
Hansen test			376.93 (1.000)	382.67 (1.000)

Lagged total debt ratio has a significant positive impact on total debt ratio according to all the models (at any significance level). However, the magnitude of its impact differs largely between the models – it is the lowest in GMM-DIFF model (0.3789), while the highest for OLS model (0.7691).

Profitability has a negative significant influence on debt ratio for all the models (at significance level 0.05 for GMM-DIFF and at any significance level for other estimators). The impact of this variable also varies considerably depending on the estimator chosen, being the lowest for GMM-DIFF (-0.0589) and the highest for GMM-SYS (-0.1257).

Size has a significant positive impact on debt ratio for all the models (at any significance level). It should be noted, however, that the differences in its parameters are even higher than for lagged debt ratio and profitability. The lowest parameter estimate is produced by OLS model (0.0095). For GMM-SYS and GMM-DIFF models the parameter in question is, respectively, 2 times and 10 times higher than for OLS model.

The impact of growth possibilities on debt ratio is not significant, though it is negative for all the models. It is close to 0 for OLS model (-0.0000021). The estimate generated by GMM-SYS model is 2 times higher than those from GMM-DIFF and FE models.

When it comes to tangibility of assets, its influence on debt ratio is also insignificant. It is the only explanatory variable, for which parameter estimate is positive for FE model, while negative for other models.

Negative significant impact of business risk on debt ratio was also identified by all the models (at any significance level for OLS, FE and GMM-DIFF estimates, at 0.05 significance level for GMM-SYS estimate). The lowest magnitude of the parameter in question was observed for OLS model, while the highest for GMM-SYS model (more than 6 times higher than for OLS).

Industry mean debt ratio has a negative significant impact on debt ratio according to all the models (at 0.05 significance level for OLS model, at any significance level for FE, GMM-DIFF and GMM-SYS models). The magnitude of influence also differs between the models – the lowest is FE estimate (-0,1145), and the highest is GMM-SYS estimate (ca. 1.5 times higher than FE and OLS estimates).

Comparing parameters' standard errors for models presented in Table 2., the estimates for GMM-SYS are lower than GMM-DIFF standard errors for all explanatory variables. Standard errors for profitability and industry mean debt ratio are lower with GMM-SYS than with OLS.

Moreover, they are lower than estimated by FE method for size, tangibility of assets and business risk.

The second part of Table 2. presents the results of post-estimation tests for GMM models, i.e. the values of test statistics and its probability values (Pr>z for Arellano-Bond tests and Prob>chi2 for Sargan and Hansen tests). For the GMM-DIFF model, Arellano-Bond test suggest presence of autocorrelation of residuals up to third order (but not of fourth order), while Hansen test's implausible value of 1.000 suggest that the number of instruments is too large in comparison to number of observations [40]. Therefore the instruments of GMM-DIFF are not valid. The same conclusion is reached on the basis of GMM-SYS tests. In order to improve the properties of instruments, only lags of fourth order and higher should be used for estimation. The results of fitting the GMM-DIFF and GMM-SYS models with instruments lagged four and higher are presented in Table 3. GMM-DIFF1 and GMM-SYS1 include all possible lags from fourth order, while GMM-DIFF2 and GMM-SYS2 are based on, respectively, lags four to seven and four to six.

Table 3: Parameter estimates of GMM-DIFF and GMM-SYS models with further lags of instruments

variable	GMM-DIFF1	GMM-DIFF2	GMM-SYS1	GMM-SYS2
debt ratio	0.3600 *0.0861*	0.4126 *0.0998*	0.7151 *0.0479*	0.7748 *0.0529*
profitability	-0.1546 *0.0545*	-0.1991 *0.072*	-0.1771 *0.0581*	-0.1936 *0.0701*
size	0.0996 *0.0275*	0.1178 *0.02973*	0.0167 *0.0057*	0.0167 *0.0056*
growth possibilities	0.0016 *0.0024*	0.0015 *0.1065*	0.0006 *0.0017*	0.00057 *0.0022*
tangibility of assets	-0.2031 *0.0976*	-0.1955 *0.1065*	-0.0432 *0.0380*	-0.0307 *0.0379*
business risk	-0.0538 *0.1701*	-0.008 *0.1805*	-0.1656 *0.0817*	-0.1991 *0.1009*
industry median debt ratio	-0.2441 *0.0763*	-0.3085 *0.0837*	-0.2206 *0.0481*	-0.2808 *0.0511*
constant			0.0690 *0.0707*	0.0671 *0.0702*
N	2653	2653	3079	3079

variable	GMM-DIFF1	GMM-DIFF2	GMM-SYS1	GMM-SYS2
number of instruments	306	206	369	228
Arellano-Bond test for AR(1)	-6.72 (0.000)	-6.62 (0.000)	-10.14 (0.000)	-9.97 (0.000)
Arellano-Bond test for AR(2)	-4.46 (0.000)	-4.01 (0.000)	-4.48 (0.000)	-4.22 (0.000)
Arellano-Bond test for AR(3)	5.22 (0.000)	4.98 (0.000)	6.83 (0.000)	6.63 (0.000)
Arellano-Bond test for AR(4)	-0.10 (0.920)	0.00 (0.996)	-0.19 (0.852)	-0.09 (0.926)
Sargan test	435.86 (0.000)	354.21 (0.000)	658.76 (0.000)	529.05 (0.000)
Hansen test	254.26 (0.971)	222.81 (0.119)	275.64 (1.000)	244.82 (0.120)

At 0.05 significance level, estimates for all the models presented in Table 3. suggest significant impact of lagged debt ratio, profitability, size and industry mean debt ratio on companies' debt ratios. Moreover, GMM-DIFF1 model (with lags four and further) suggest that tangibility of assets has negative impact on debt ratios. According to GMM-SYS estimates, the impact of business risk on debt ratios is significantly negative (although with GMM-SYS1 only at 0.1 significance level).

In the GMM-DIFF2 model (with lower number of instruments) all the explanatory variables have the same direction of influence on debt ratio as in GMM-DIFF1 model. However, the coefficients for lagged debt ratio and size are higher than in GMM-DIFF1, while for profitability, growth possibilities, tangibility of assets, business risk and industry mean debt ratios they are lower than in GMM-DIFF1 model. Differences in parameters' magnitude between GMM-DIFF2 and GMM-DIFF1 models are highest for business risk (-85.1%), profitability (+28.8%) and industry median debt ratio (+26,4%).

In comparison with basic GMM-DIFF model (estimates reported in Table 2.), the GMM-DIFF2 (estimates reported in Table 3.) parameters' estimates were higher for lagged debt ratio, size and business risk, while lower for profitability, tangibility of assets and industry mean debt ratio. It should be noted that while growth possibilities have positive influence on debt ratios according to GMM-DIFF1 and GMM-DIFF2 estimates, the basic GMM-DIFF model (Table 2.) suggested its negative impact. Taking into account the magnitude of parameters, the impact of tangibility of assets is more than 70 times higher for GMM-DIFF2 model than for GMM-DIFF.

Moreover, the coefficient for profitability is 3.4 times higher for GMM-DIFF2, while for industry median debt ratio it is2.2 times higher than for GMM-DIFF.

The direction of parameter changes between GMM-SYS2 and GMM-SYS1 matches the one observed for GMM-DIFF2 and GMM-DIFF1 except for business risk. When comparing GMM-SYS2 and GMM-SYS (estimates reported in Table 2.), the direction of parameter changes is also similar to those of Arellano-Bond (1991) estimators. The exceptions are parameters for size (lower for GMM-SYS2 than for GMM-SYS) and for tangibility of assets (higher for GMM-SYS2 than for GMM-SYS).

The differences in magnitude between models estimated with Blundell-Bond (1998) method are smaller than for Arellano-Bond (1991) method. The GMM-SYS2 parameters are higher than for GMM-SYS1 for industry median debt ratio (+44.4%), growth possibilities (+33.3%) and business risk (+25.9%). When GMM-SYS (Table 2.) is taken into account, the magnitude of GMM-SYS2 parameters is higher for business risk (3.2 times higher), industry median debt ratio (1.6 times higher) and for profitability (1.5 times higher).

Comparing standard errors of the parameters, their estimates for all the explanatory variables are higher for GMM-DIFF2 model than for GMM-DIFF1 and GMM-DIFF models. A similar conclusion can be reached for GMM-SYS2 model in comparison to GMM-SYS1 and GMM-SYS models. At the same time, it should be noted that the standard errors for the GMM-SYS2 model are lower than for GMM-DIFF2 model.

As far as instruments' validity tests are concerned, the models presented in Table 3. confirm the existence of autocorrelation of residual differences up to third order, as it was observed with GMM-DIFF and GMM-SYS models presented in Table 2.. However, this is not a problem, since the estimation was based on explanatory variables lagged four and more periods as instruments. At 0.05 significance level, Hansen test implies the joint validity of overidentifying restrictions. Therefore both GMM-DIFF2 and GMM-SYS2 models can be assessed as valid.

Taking into the consideration lower estimates of parameter standard errors for GMM-SYS2 than for GMM-DIFF2, as well as autocorrelation up to third order identified in both models and joint validity of overidentifying restrictions, GMM-DIFF2 model is considered as appropriate for assessing the importance of selected determinants of capital structure. The positive impact of lagged total debt ratio on total debt ratio of companies is consistent with the predictions of trade-off theory, as well as results of previous studies. Profitability has significant negative influence on debt ratio is against trade-off theory, but in line with the predictions of pecking order theory. The negative impact of profitability was also confirmed by previous research [e.g. 12, 20, 38]. The positive impact of size on debt ratios is in accordance with both trade-off theory and pecking order theory. It is also in line with previous research [e.g. 12, 17, 20, 38]. Also negative impact of business risk on debt ratios is expected on the basis of both theories and results of previous research [e.g. 12, 17, 20, 38]. Although all the models estimated within this study agree on the negative impact of industry mean debt ratio on companies' debt ratio, it is contrary to the findings of previous studies [e.g. 16, 17, 21]. Therefore it should be concluded that the impact of industry classification on companies' debt ratios requires further investigation.

CONCLUSIONS

Both the parameter and standard error estimates of selected capital structure determinants differ widely depending on the estimation method for regression model. Not only the magnitude, but also the direction of influence may change when a different estimator is used. Taking into account the assumptions of OLS and FE methods, the determinants of capital structure should be analyzed with GMM estimators. The researchers should also take into account the validity of GMM models, which can be assessed by Arellano-Bond test for autocorrelation of residuals and Hansen test for validity of overidentifying restrictions.

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