CAPITAL STRUCTURE ANALYSIS – THEORIES AND DETERMINANTS VALIDATION BASED ON EVIDENCE FROM THE CZECH REPUBLIC

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Abstract: *The optimal capital structure is a key precondition for business, even though the task of defining the optimal capital structure can be difficult. Previous studies present many different and mutually contradictory factors that should be considered with respect to managerial strategic financial decisions. The first part of the presented contribution summarises the effects of the most frequent capital structure determinants and reviews the world's most important theories about the behaviour of enterprises when deciding on capital structure. The aim of our contribution is the analysis of capital structure behaviour in the Czech environment. Fundamental capital structure theory is revealed by statistical hypotheses testing. Moreover, we are mainly targeting significant determinants of capital structure. The results help us to create general recommendations for the financial management of Czech companies. In the scope of our study, there are approximately a thousand national financial statements of Czech companies from the most important sectors of economic activity for the period 2016–2019. The correlation analysis with partial correlation coefficient and multiple linear regression analysis was utilised to determine the effects and significance of the individual determinants. Data show that Czech companies do not prefer debt financing recommended by some capital structure theories. Their financial management behaviour corresponds to pecking order theory with insufficient utilisation of tax shield. Sectorwise analyses prove only one exception; motor vehicles wholesale, retail trade, repair and maintenance sector generally prefers financing by debt. Based on the literature review, we selected six significant determinants of capital structure: size, return on assets (ROA), return on equity (ROE), tangibility, asset growth and duration. Advanced statistical analyses show the power and influence of each determinant on capital structure and their mutual relations. Autocorrelations can negatively affect the results of regression analyses. We can conclude that the capital structure of Czech companies is mainly influenced by tangibility and ROA.*

Introduction

Utilisation of the balanced capital structure creates the base for the stable development of any company. Having optimal capital structure is a key strategic task for financial management. Currently, there is a myriad of theories describing the current state and recommending the optimal state of enterprises' capital structure. Fundamental ones are the Modigliani-Miller theorem (Modigliani & Miller, 1958, 1963), the trade-off theory (Kraus & Litzenberger, 1973), the pecking order theory of capital structure (Fisher & Donaldson, 1962), and dynamic trade-off models (Brealey & Myers, 2014).

Verifying the statement: "The behaviour of Czech companies confirms the preference for debt financing over equity. This behaviour is the same across sectors." is the first goal of this contribution. Based on the result, we can reveal fundamental capital structure theory for Czech companies and we can set the recommendations valid for the Czech environment in general. This will help financial managers to lead their enterprises into balanced capital structures.

Capital structure determinants have been examined in a huge set of studies. Most current works focus on the power of dependence; nevertheless we can still find the research gap within them. They are missing mutual relations and influences, classification, and regional focus. Main goal of this contribution is the classification of significant determinants of capital structure in the scope of the Czech Republic together with autocorrelations and power of dependence.

This paper consists of three main sections: Theoretical Background, Research Methodology, and Research Results. The Theoretical Background section summarises and reviews the world's most important theories about the behaviour of enterprises when deciding on capital structure and the effects of the most frequent capital structure determinants. The Research Results section is divided into seven subsections: Sample Analysis of the Original Dataset of Capital Structure, Verification of *H1*, Sample Characteristics of Selected CS determinants, significance of selected CS determinants, Mutual Relations between Determinants, Linear Regression Model with All Selected Determinants, and Summary of Results and Discussion. The whole contribution is ended with a concluding section.

1. Theoretical Background
1.1 View on Theories of Capital Structure

Several important theories have been proposed regarding capital structure.

The Modigliani-Miller (M&M) theorem is a capital structure approach named after Franco Modigliani and Merton Miller, two economics professors who studied capital structure theory and collaborated to develop the capital structure irrelevance proposition in 1958. This proposition states that, in perfect markets, the capital structure a company uses does not matter, because the market value of a firm is determined by its earning power and the risk of its underlying assets. According to Modigliani and Miller, value is independent of the method of financing used and the company's investments. The M&M theorem made two following propositions. The first one asserts that the capital structure is irrelevant to the value of a firm. The value of two identical firms would remain the same, and value would not be affected by the choice of financing adopted to support the assets. The value of a firm is dependent on the expected future earnings when there are no taxes (Modigliani & Miller, 1958). Proposition II states that the financial leverage boosts the value of a firm and reduces WACC when tax information is available. While the Modigliani and Miller theorem is studied in finance, real firms face taxes, credit risk, transaction costs, and inefficient markets, which creates a mix of debt and equity financing important (Modigliani & Miller, 1963).

The trade-off theory of capital structure represents the idea that a company chooses how much debt finance and how much equity finance to use. The classical version of the hypothesis traces back to Kraus and Litzenberger (1973), who considered a balance between the deadweight costs of bankruptcy and the tax-saving benefits of debt. This theory is often set up as a competitor theory to the pecking order theory of capital structure (Frank & Goyal, 2007).

The pecking order theory postulates that the cost of financing increases with asymmetric information. This theory was first suggested by Fisher and Donaldson (1962), and it was modified by Stewart C. Myers and Nicolas Majluf in 1984 (Myers & Majluf, 1984). According to this theory, asymmetric information affects the choice between internal and external financing. Asymmetric information favors the issue of internal resources over external ones, as the

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issue of debt signals the board's confidence that an investment is profitable and that the current stock prices in undervalues (Brealey & Myers, 2014).

Fama and French (1999) criticised both the trade-off theory and the pecking-order theory according to Myers' argument (Myers, 1984). Dynamic trade-off models have been also confirmed as well as rejected empirically.

The findings by Booth et al. (2001) suggest that, although some of the insights from modern finance theory are applicable across countries, much progress remains to be made to understand the impact of the different institutional features on capital structure choices. Leverage differs across countries (De Jong et al., 2008). Yang et al. (2021) showed that Korean and Greek shipping companies follow the pecking-order theory. Indeed, the empirical evidence from Frank and Goyal (2007) seemed reasonably consistent with some versions of the trade-off theory of capital structure. Similarly, Delikanli (2020) presented that SMEs in Turkey had tried to meet their financing needs with internal resources, acting in alignment with pecking-order theory. Ngatno et al. (2021) supported the view of pecking-order theory as empirical evidence of the opposite effect between firms' profit and capital structure. The direction of influence of the diagnosed firm-specific factors had been consistent with pecking-order theory, as stated by Czerwonka and Jaworski (2021). An important purpose of the theory is to explain the fact that corporations are usually financed partly with debt and partly with equity. This theory states that financing with debt brings tax benefits as well as costs, and the costs of financial distress include both bankruptcy costs of debt and non-bankruptcy costs. Myers (1984) suggested that if the trade-off theory were true, then firms ought to have much higher debt levels than we observe in reality.

1.2 Recent Research on Determinants of Capital Structure

Several studies were considered during the preparation of our paper. Chandra et al. (2021) found that the factors that influence capital structure included effective tax rate, financial flexibility, growth, uniqueness, asset utilisation, firm size, and tangibility. Ngatno et al. (2021) indicated that capital structure had a negative effect on both return on assets and return on equity. Jaworski and Czerwonka (2021)

obtained strong evidence for a positive relationship between corporate debt and tangibility and size and a negative relationship for profitability and liquidity. The factors that also affect the share of debt capital turned out to be growth (positive relationship) and non-debt tax shield (negative relationship). They further showed that the growth of industry business risk was accompanied by any increase in corporate debt. Moreover, these authors showed that a business-friendly institutional environment was an important influencing factor on the indebtedness of companies. It increased the leverage and, consequently the return on equity, especially in CEE countries.

Gurusamy (2021) presented that the fixed-effects results, size, risk, and profitability had a highly significant relationship with leverage. Meanwhile, growth opportunities and tangibility represented insignificant values. The study revealed that the explanatory variables of the promoters' ownership and institutional ownership had a negative impact on leverage, while corporate ownership had a positive influence on the capital structure decision. Fenyves et al. (2020) presented the agricultural and food industry in V-4 countries and showed that more profitable companies were less dependent on debt finance, while the fast-growing companies had limited access to the financial market. Company size had a significant effect only in the Czech Republic. Dokulil et al. (2020) showed that the budgeting practices of the Czech firms were not influenced by traditional factors (e.g., the size of the company and its given economic sector) or certain other aspects. Essential facets include the ownership structure and the share of foreign capital involved, the latter affecting the extent of autonomy of the business as to the budgetary process. Delikanli (2020) found that no significant difference was observed based on size. The analysed SMEs' asset growth and increase in profitability caused an increase in financial debt. Memon et al. (2020) showed that firms' size, profitability, stock market development, and GDP were relatively consistent determinants.

Belas et al. (2018) studied the impact of four determinants: region, business area, number of employees, and business duration, on the manager's decisions regarding capital structure in the SMEs in the Czech Republic. Their main finding was that the size of the company, measured by the number of employees,

affects its attitude toward the volume of foreign and its own capital used to finance its activities. The analysis also showed that entrepreneurs who had been operating their business at longer duration preferred more foreign capital than their own capital. The business area and region where the enterprise was located were insignificant determinants. Mursalim et al. (2017) analysed the capital structure and its determinants as profitability, size, and volatility. Furthermore, Balios et al. (2016) found that the effect of capital structure determinants on leverage had not changed in an environment of economic crisis, larger SMEs had continued to show higher debt ratios, the relationship between profitability and tangibility of assets with leverage had continued to be negative, and growth had been positively related to leverage. In addition, Serrasqueiro et al. (2016) showed that capital structure profitability, size, duration, tangibility, and region were determinants.

Alipour et al. (2015) suggested that variables such as firm size, financial flexibility, asset structure, profitability, liquidity, growth, risk, and ownership had affected all measures of capital structure among Iranian corporations. They showed that, due to the negative relationship between profitability and capital structure, investors had to consider capital structure before making investment decisions. Růčková (2015) showed that capital structure was determined by sector, business risk, financial flexibility, approach to risk, and taxes. On the other hand, the key determinants of capital structure, according to Chadha and Sharma (2015), were size, duration, tangibility, growth, profitability, risk, uniqueness, and ownership. Furthermore, Vatavu (2015) showed that capital structure was negatively influenced by profitability. Oztekin (2015) observed high dependence between capital structure and size, tangibility, profitability, and environment, and Chang et al. (2014) identified profitability, industry leverage, asset growth, tangibility, firm size, state control, and the largest shareholding as reliable core factors explaining book leverage. Robb and Robinson (2014) found that the capital structure was determined by credit markets and duration. In addition, Dawar (2014) found a relation between leverage and firm performance after controlling for factors such as size, age, tangibility, growth, liquidity, and advertising and showed a negative dependence on firm performance.

Bayrakdaroglu et al. (2013) showed that larger companies and fast-growing companies tended toward a higher leverage. Aulová and Hlavsa (2013) analysed Czech agricultural companies and found that the most important determinants were size and asset collateral. Prášilová (2012) found that capital structure was influenced by duration (positively) and profitability (negatively). According to Prášilová, there was a negative dependence of size and positive dependence of retained earnings in a specific IT sector. Ramjee and Gwatidzo (2012) found that the capital structure had been determined by tangibility, growth, size, and risk. They also showed the negative influence of profitability and tax. Chen and Chen (2011) suggested that firm size, profitability, and asset structure were explanatory variables of capital structure. Previously, there had been some differences in the capital structure among industry type, which they also presented. Furthermore, these researchers found that profitability and firm size had a greater impact on capital structure in non-electronic industries. Kouki and Ben Said (2011) analysed French companies and found that capital structure was determined by size, profitability, growth, tax shield, asymmetric information, and financial distress.

Bhaird and Lucey (2010) found that the influence of age, size, ownership structure, and provision of collateral were similar across industry sectors, indicating the universal effect of information asymmetries. Frank and Goyal (2007) explained the most reliable factors of leverage as median industry leverage (+ effect on leverage), market-to-book assets ratio (−), tangibility (+), profits (−), log of assets (+), and expected inflation (+). They also found that dividend-paying firms tended to have lower leverage. They also presented that size, market-to-book ratio, and the effect of inflation were not reliable. Marks et al. (2009) showed that the following factors influenced capital structure: character of companies, life cycle, dynamics in the sector, shareholders' goals, capital market, legislative, and sector trends.

Viviani (2008) found a positive relationship between debt and ownership. He also showed that capital structure was affected by sector. Valach (2008) presented that capital structure was affected by size, profitability, tangibility, and growth. According to Valach, taxes and sector were not significant factors. Almazan and Molina (2005) found the dispersion in leverage

ratios among firms within an industry and related this dispersion to industry characteristics. Song (2005) found that the determinants of tangible assets and taxes influenced capital structure. Bauer (2004) presented that the leverage of Czech-listed firms was positively correlated with size, and it was negatively correlated with profitability and tangibility. There was a negative relationship between leverage measured in market value and growth opportunities. Moreover, leverage was positively correlated with tax and negatively correlated with non-debt tax shields, albeit on a lower level of statistical significance.

Tab. 1 summarises significant capital structure determinants mentioned in previous studies. The most frequent determinants are: size, profitability, tangibility, asset growth, sector, and duration.

Other factors not mentioned in Tab. 1 that influence the capital structure can be summarised as follows:
a) Taxes and tax shield, e.g., Fan et al. (2012), Hrdý (2011), Kumar et al., (2017) and, Acaravci (2015).
b) Risk including firm risk and macroeconomic risk, e.g., Li et al., (2021) and, Baum et al. (2017).

Tab. 1: **The most frequent determinants of capital structure – Part 1**

Authors	Year	Size	Profitability	Tangibility	Asset growth	Sector	Duration
Chandra et al.	2021	x		x	x		
Ngatno et al.	2021		−				
Jaworski & Czerwonka	2021	+	−	+	+		
Gurusamy	2021	x	x	(x)	(x)		
Fenyves et al.	2020	x	−				
Dokulil et al.	2020	x				x	
Delikanli	2020	(x)	x		+		
Memon et al.	2020	x	x				
Belas et al.	2018	x				(x)	+
Mursalim et al.	2017	x	x				
Balios et al.	2016	+	−	−	+		
Serrasqueiro et al.	2016	x	x	x			x
Alipour et al.	2015	x	−	x	x		
Růčková	2015					x	
Chadha & Sharma	2015	x	x	x	x		x
Vatavu	2015		−				
Oztekin	2015	x	x	x			
Chang et al.	2014	x	x	x	x	x	
Robb & Robinson	2014						x
Dawar	2014	−	x	x	x		x
Bayrakdaroglu et al.	2013	+			+		
Aulová & Hlavsa	2013	x					
Prášilová	2012	−	−				+
Ramjee & Gwatidzo	2012	x	−	x	x		

Authors	Year	Size	Profitability	Tangibility	Asset growth	Sector	Duration
Chen & Chen	2011	x	x	x		x	
Kouki & Ben Said	2011	x	x		x		
Bhaird et al.	2010	x				x	x
Frank & Goyal	2007	(x)	–	+	+	+	
Marks et al.	2009					x	x
Valach	2008	x	x	x	x	(x)	
Viviani	2008					x	
Almazan & Molina	2005					x	
Song	2005			x			
Bauer	2004	+	–	–			
Frequency		24	22	15	13	9	8

Source: own

Note: x : confirmed dependence; + : confirmed positive dependence; – : confirmed negative dependence; (x) : confirmed independence.

c) Characteristics of CEO, e.g., CEO aggressiveness (Prášilová, 2012; Růčková, 2015), CEO age (McGuinness, 2021), CEO behaviour under pressure (Berger et al., 1997), management discussion and analysis (Wang et al., 2021), and educated CEO (Honjo, 2021).

d) Other inner determinants: dividend paying (Frank & Goyal, 2007), market value (Baker & Wurgler, 2002), asymmetric information (Serrasqueiro et al., 2016), financial flexibility (Alipour et al., 2015), earnings management in Okyere et al. (2021), and An et al. (2016), advertising (Dawar, 2014), debt capacity (Honjo, 2021), uniqueness (Chadha & Sharma, 2015), financial stress = risk of losing control (Cho et al., 2014), liquidity (Jaworski & Czerwonka, 2021).

e) Ownership: local ownership (Mavruk & Sjogren, 2021), institutional ownership and corporate ownership (Gurusamy, 2021), and ownership generally (Dokulil et al., 2020).

f) Location: region (De Jong et al., 2008; Gao et al., 2011), local corruption (Fan et al., 2012), developed and developing countries (Baker & Wurgler, 2002).

g) Macroeconomic and other external determinants such as inflation (Jaworski & Czerwonka, 2021), financial institution development capital market (Robb & Robinson, 2014), GDP and development of market (Memon et al., 2020), economic policy uncertainty (Li & Qui, 2021), financial crisis (Baum et al., 2017), state control (Chang et al., 2014), legislation (Fan et al., 2012), and competition (Prášilová, 2012).

Although there exist a myriad of research papers dealing with capital structure determinants, as summarised above, we can still find the research gap within them. In general, previous studies do not recognise positive or negative dependence between capital structure and its determinant, and they are not focused on the Czech environment. Profitability is the second most frequent determinant of the capital structure; however, measures of profitability are not unified and sometimes not even mentioned. We are examining two profitability measures (ROA and ROE) to see, which one of them is a better capital structure determinant. Mutual relations between determinants are generally neglected as well. A basic assumption of regression analysis is that explanatory variables are independent. Therefore utilisation of strongly correlated determinants can significantly affect regression model results.

1.3 Goals and Hypotheses

As a first step, a hypothesis has been established to reveal the general behaviour of enterprises in the Czech environment. Verified hypothesis *H1* is stated as follows.

H1: The behaviour of Czech companies confirms the preference for debt financing over equity. This behaviour is the same across sectors.

Hypothesis statement origins from the trade-off theory (Kraus and Litzenberger, 1973), where debt financing is preferred over equity up to a given critical financial level.

Main aim of our contribution is targeted in the second step, where significant determinants of the capital structure of Czech companies are detected. We are searching them within the most frequent determinants: size (SI), profitability (ROA, ROE), tangibility (T), asset growth (AG), sector (SE), and duration (DU), that has been identified in the previous section (Tab. 1). Additionally to the statement of capital structure determinant significance, we classify them into four groups: strong significance, medium significance, weak but still significant and not significant. Moreover, we recognise positive resp. negative impact of selected determinant

on indebtedness. Comparing the performance of two different profitability measures (ROA and ROE), we can recommend the one more suitable for the Czech environment.

Last but not least, the correlation analysis within selected determinants is performed. It reveals correlations that can misrepresent regression analysis results. This leads to the recommendation about pairs of determinants that should not be applied together.

2. Research Methodology
2.1 Data Sources

The source dataset, generated from selected records in the publicly available register (ARES, 2020), consists of 1,196 unconsolidated national financial statements of Czech companies within the period of 2016–2019. A crucial factor for company selection is that they have not been liquidated before August 31, 2020. Other entrance criteria, such as the legal form, size, and duration were not implemented. Tab. 2 presents data processing to determine determinants.

2.2 Methodology

First of all, the entire dataset was analysed using sample statistics. Outliers and unreliable

Tab. 2: Data processing to determine determinants

Determinant	Registry data used	Form of processing
Size (SI)	Number of employees	Classification according methodology (Zákon č. 563/199 Sb., Zákon o účetnictví, 2016 [Act No. 563/199 Coll. on Accounting, the Czech Republic, 2016**])
Profitability	Profit, equity, assets	Indicators return on asset (ROA) and return on equity (ROE)
Tangibility (T)	Fixed assets, assets	Share of fixed assets in total assets
Asset growth (AG)	Assets	Rate of asset growth
Sector (SE)	Economic activity	Classification of selected* economic activities CZ-NACE: A – Agriculture, forestry, and fisheries; C – Manufacturing; F – Construction; G – Wholesale and retail trade, repair and maintenance of motor vehicles; I – Accommodation, catering, and hospitality; J – Information and communication activities
Duration (DU)	Age of company	

Source: own

Note: *The most important areas of the national economy other than finance and insurance (Area K) were selected, as this sector is specific to its high indebtedness, which is given by receiving deposits from clients; **https://aplikace.mvcr.cz/sbirka-zakonu/SearchResult.aspx?q=2016&typeLaw=zakon&what=Rok

data that do not correspond to common economic principles were omitted. For all upcoming analyses, normality was assumed, and the significance level was pre-set to α = 0.05. The correlation analysis with partial correlation coefficient and multiple linear regression analysis was utilised to determine the effects and significance of individual determinants. The powerful software tool Statistics 12 was helpful in our analyses. The correlation analysis tested individual determinants to see if they were suitable determining variables. Appropriate determinants were subjected to regression analysis to determine the magnitude of the impact on the capital structure and the type of this dependency (positive, negative effect).

The partial correlation measures the correlation between two variables that remains after controlling for the effects of one or more other predictor variables. The semi-partial correlation is a better indicator of the practical relevance of a predictor because it is scaled relative to the total variability in the response variable. The general purpose of multiple regressions is to learn more about the relation between several predictor variables and the response variable. Outliers (extreme cases) can seriously bias the results of regression analyses, and therefore they should be detected and dealt with appropriately (Hill & Lewicki, 2007).

3. Research Results

3.1 Sample Analysis of Original Dataset of Capital Structure

Fig. 1 and Tab. 3 indicate that there are remote values that are caused by negative equity. The values of capital structure (CS) range from −4.5 to 70, showing that some companies have 70 times more debt than equity. From a market point of view, undertakings with negative equity should not function at all. This suggests that company is working on the irrational economic

Fig. 1: Sample analysis of original dataset of capital structure
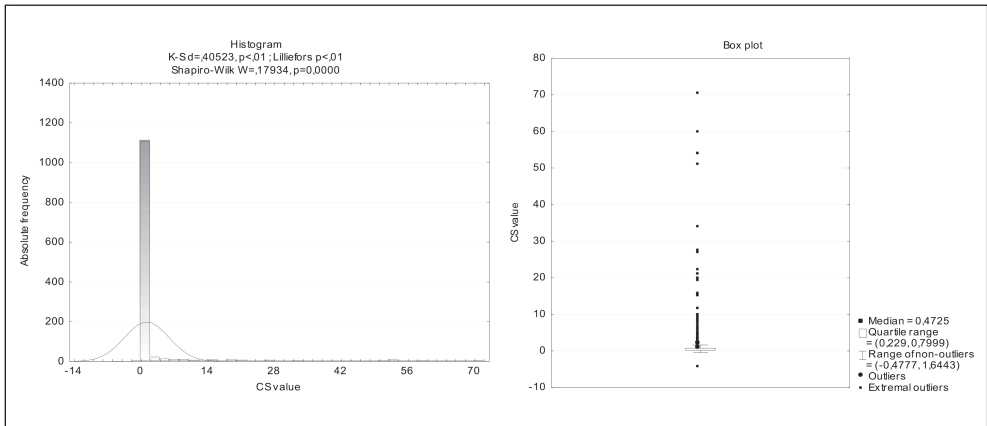
Source: own (Statistics 12 software)

Tab. 3: Sample analysis of original dataset of capital structure

Variable	Sample statistics of original CS								
	N	Aver.	Med.	Min	Max	Std. deviation	Variation coef.	Skew.	Kurt.
CS	1,162	1.169	0.473	−4.549	70.197	4.681	400.136	10.047	114.714

Source: own (Statistics 12 software)

principles. Generally speaking, these undertakings persist only because it is the interest of another party; e.g., a parent company that subsidises additional capital to its subsidiary, such as in the form of loans.

In view of the above findings and the area of examination of the capital structure, this part of the companies with negative equity was excluded from the sample population. Only data ranging from the understandable 0 to 1 are considered in the following analyses (these companies were marketed as outliers), specifically 13.7% of companies across all sectors. Other outliers were detected for ROE analyses (companies with a value higher than 5 are not counted) and AG analyses (companies with a value higher than 8 are not counted).

Sample distribution and other sample characteristics for the cleaned dataset are illustrated in the following Fig. 2 and Tab. 4. This table also shows the minimum and maximum limits,

at an interval (0–1), which corresponds to the modified dataset. The average value of capital structure is higher than the median. These quartiles show that more than 50% of companies have an indebtedness of less than 50%; i.e., most companies prefer equity financing. This confirms the left skew of the distribution of CS. It seems that selected companies do not prefer debt. This hypothesis will be tested in the following subchapter.

3.2 Verification of Stated Hypothesis 1 (*H1*)
H1: The behaviour of Czech companies confirms the preference for debt financing over equity. This behaviour is the same across sectors.

This chapter tests this hypothesis. First, let us test the hypothesis that the mean capital structure is higher than 0.5, regardless of the selected sector. As normality is assumed, one sample *t*-test with $t = -7.74$ and *p*-value at

Tab. 4: Sample analysis of modified dataset of capital structure

Variable	Sample statistics of modified CS									
	N	Aver.	Med.	Low. quart.	Up. quart.	Quart. range	Std. deviation	Var. coef.	Skew.	Kurt.
CS	1,012	0.429	0.401	0.181	0.680	0.499	0.290	67.656	10.047	−1.132

Source: own (Statistics 12 software)

Fig. 2: Sample analysis of modified dataset of capital structure
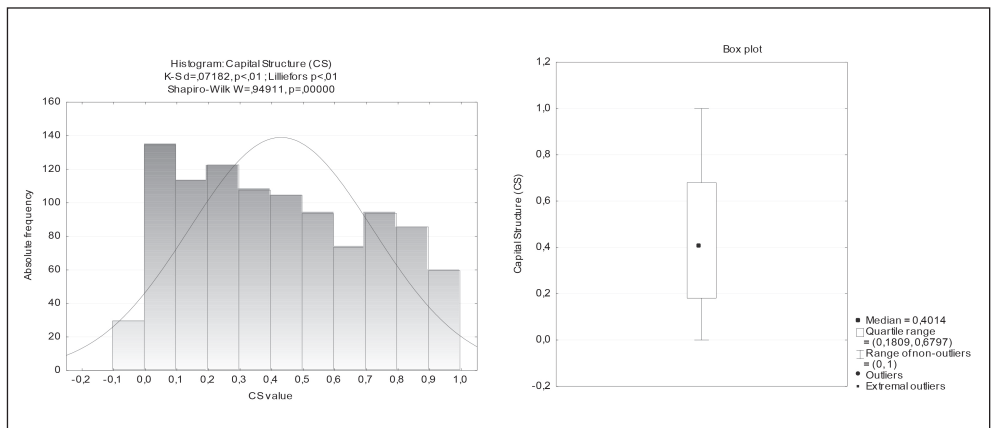
Source: own (Statistics 12 software)

Tab. 5: Testing *H1* across all sectors

Variable	One sample *t*-test with reference value						
	Aver.	Std. deviation	N	Reference value	*t*-value	df	P-value
CS	0.429	0.290	1,012	0.5	−7.743	1,011	0.000

Source: own (Statistics 12 software)

Tab. 6: Testing *H1* for individual sectors

Variable	One sample *t*-test with reference value						
	Aver.	Std. deviation	N	Reference value	*t*-value	df	P-value
CS-A	0.413	0.284	180	0.5	−4.115	179	0.000
CS-C	0.366	0.277	164	0.5	−6.223	163	0.000
CS-F	0.444	0.259	188	0.5	−2.976	187	0.003
CS-G	0.496	0.306	172	0.5	−0.166	171	0.869
CS-I	0.437	0.333	164	0.5	−2.437	163	0.016
CS-J	0.415	0.268	144	0.5	−3.803	143	0.001

Source: own (Statistics 12 software)

almost 0 shows that *H1* must be rejected. Data show that Czech companies do not prefer debt financing (Tab. 5).

When the same test is performed sector-wise, as shown in Tab. 6, equity is preferred in most sectors. The only exception is sector G – Wholesale and retail trade. This sector behaves differently from others, and it prefers debt financing over equity (Tab. 6). This result proves that the sector is an important determinant of capital structure. Nevertheless, this behaviour should not have a statistically significant impact on other determinants of the capital structure, so we will leave this sector in our further analyses.

3.3 Sample Characteristics of Selected CS Determinants

Let us present the sample statistical characteristics of analysed determinants. They are

Tab. 7: Sample characteristics of selected CS determinants

Variable	Sample statistics									
	Aver.	Med.	Min	Max	LQ	UQ	Std. deviation	Variation coef.	Skew.	Kurt.
ROA	0.07	0.03	−1.20	0.951	0.007	0.099	0.161	225.189	−0.173	14.35
ROE	0.13	0.07	−2.59	4.398	0.012	0.198	0.408	307.722	1.791	36.013
Tangibility (T)	0.44	0.47	-0.07	0.998	0.156	0.698	0.311	69.766	0.096	−1.22
Size (SI)	186	210	0	470	120	230	98.016	52.505	0.088	−0.11
Duration (DU)	16.2	14	4	67	8	24	9.250	57.065	1.027	3.001
Asset growth (AG)	0.18	0.03	−0.94	9.239	−0.023	0.172	0.702	387.816	7.468	77.3

Source: own (Statistics 12 software)

Fig. 3: Sample distributions of selected CS determinants
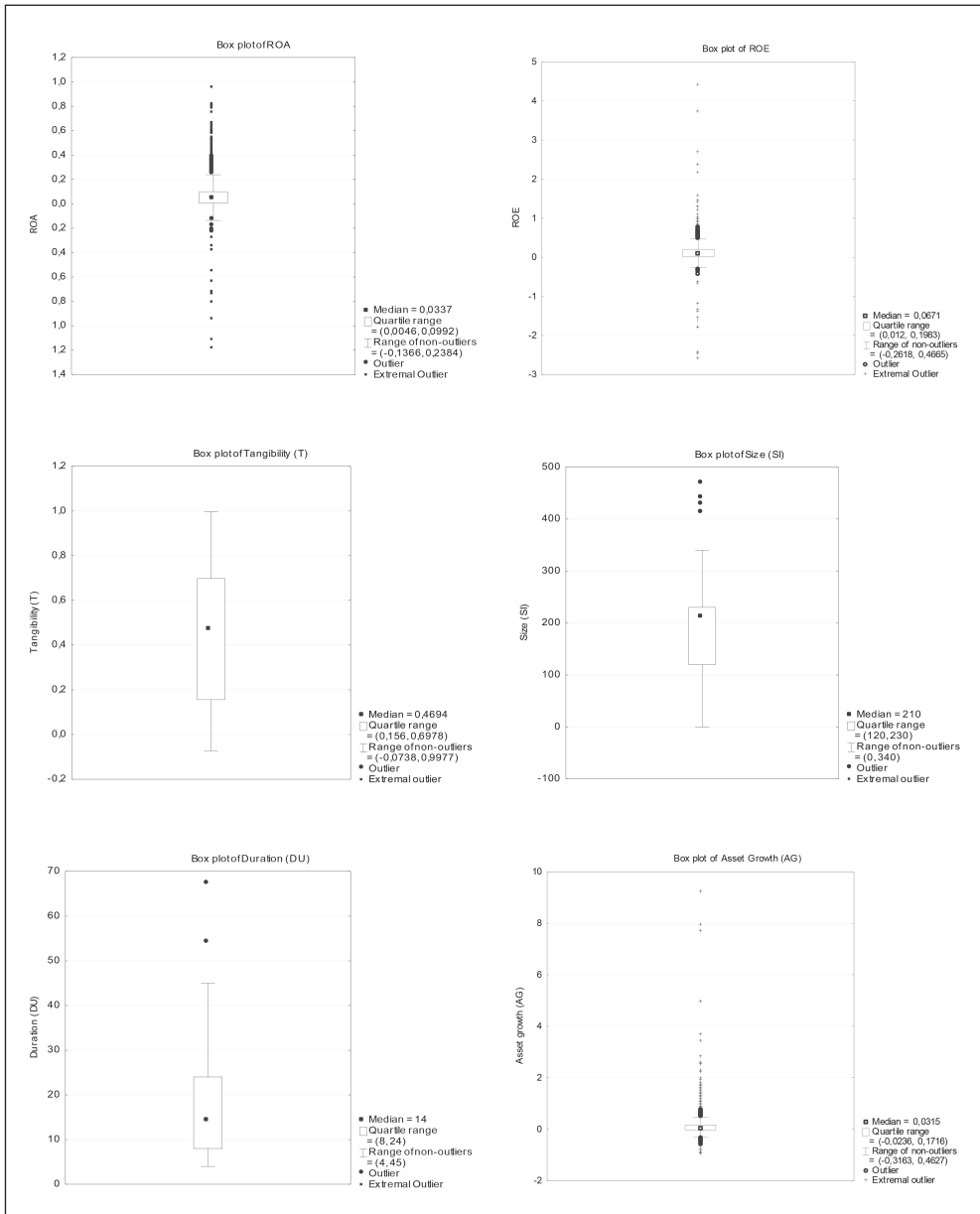
Source: own (Statistics 12 software)

summarised in Tab. 7 and sample distributions are illustrated using boxplots (Fig. 3).

ROA ranges from −1.2 to 0.95, with median = 0.033 and average = 0.07. 50% of companies have an ROA between 0 and 0.1. ROE shows much bigger variance compared to ROA with minimum of −2.59 and maximum of 4.4. Median of both profitability indicators shows that ROA is twice as small as ROE, due to the fact that, while ROA divides profit by total capital, for ROE, only part of the capital is divided. Tangibility shows almost uniform distribution between 0 and 1. This means that, for example, 25% of companies have tangibility of 25%, etc. The age of companies in determinant of duration has left skewed distribution. This confirms that young companies are more run-in. Most of the companies have less than 50 employees. Asset growth shows that most companies have lower growth than average.

The resulting sample statistics of the individual determinants show some general laws, thereby supporting the claim that the data thus modified is already reliable enough, makes economic sense, and is therefore suitable for further analysis.

3.4 Significance of Selected CS Determinants

The relation between the chosen determinant and capital structure is analysed by partial correlation that shows the power of linear dependence after removing the effects of all other predictor variables. Results are summarised in Tab. 8.

It follows from Tab. 8 that all determinants mentioned except the size determinant are significant and, therefore, suitable as the determinant of the capital structure.

Relatively weak (but still significant) effects are found in asset growth and duration. Older companies that prefer equity as the partial correlation have a negative sign. Medium strong correlations could be detected between capital structure and tangibility, ROE and ROA. Increasing values of tangibility and ROE willingness of debt are increasing as well. However, ROA shows an opposite trend, with a negative effect on capital structure.

3.5 Mutual Relations between Determinants

Mutual relations between determinants must be analysed before building the regression model, as independence of the describing variables is required. Therefore, as the next step, the correlation matrix is shown in Tab. 9 and graphically presented in Fig. 4.

The strongest positive linear dependence is between profitability determinants ROA and ROE. This makes absolute sense, as they are functionally dependent. We can conclude that ROA is a more appropriate determinant, as it does not contain a capital structure itself.

The second strongest positive dependence, between size and duration, is clear as well. It is commonly valid that older companies are larger. This is due to the expansion of businesses over time.

Tangibility and asset growth have a middle strong relation among all other determinants. As they have a medium strong partial correlation with CS, they are not appropriate variables

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Tab. 8: Relation between determinants and capital structure (CS)

Variable	Correlations with CS					
	b*	Partial corr.	Semi-partial corr.	R2	t-value	P-value
Size	0.073	0.069	0.065	0.203	1.897	0.058
Duration	−0.111	−0.103	−0.097	0.228	−2.824	0.005
ROA	−0.324	−0.256	−0.249	0.413	−7.222	0.000
ROE	0.304	0.242	0.235	0.404	6.820	0.000
Tangibility	0.160	0.163	0.156	0.054	4.522	0.000
Asset growth	0.087	0.091	0.085	0.038	2.484	0.013

Source: own (Statistics 12 software)

Tab. 9: Mutual relations between determinants

Variable	Mutual Pearson correlations between determinants					
	Size	**Duration**	**ROA**	**ROE**	**Tangibility**	**Asset growth**
Size	1.0000	0.4467	−0.0568	−0.0544	0.1075	−0.1002
		$p = 0.000$	$p = 0.120$	$p = 0.136$	$p = 0.003$	$p = 0.006$
Duration	0.4467	1.0000	−0.0442	−0.0329	0.1691	−0.1675
	$p = 0.000$		$p = 0.226$	$p = 0.367$	$p = 0.000$	$p = 0.000$
ROA	−0.0568	−0.0442	1.0000	0.6349	−0.1575	0.0833
	$p = 0.120$	$p = 0.226$		$p = 0.000$	$p = 0.000$	$p = 0.022$
ROE	−0.0544	−0.0329	0.6349	1.0000	−0.1012	0.0842
	$p = 0.136$	$p = 0.367$	$p = 0.000$		$p = 0.005$	$p = 0.021$
Tangibility	0.1075	0.1691	−0.1575	−0.1012	1.0000	−0.0840
	$p = 0.003$	$p = 0.000$	$p = 0.000$	$p = 0.005$		$p = 0.021$
Asset growth	−0.1002	−0.1675	0.0833	0.0842	−0.0840	1.0000
	$p = 0.006$	$p = 0.000$	$p = 0.022$	$p = 0.021$	$p = 0.021$	

Source: own (Statistics 12 software)

for the regression model when other determinants are utilised.

3.6 Linear Regression Model with All Selected Determinants

By analysing the correlations between the different determinants, it was found that the determinants' size and duration affect each other as well as the determinant's ROA and ROE. Therefore, an additional regression analysis was performed without inter-dependent determinants, but the results were almost identical with presented ones. Therefore, all determinants were taken in account as independent variables in the linear regression analysis. Results are summarised in Tab. 10, where column b* evaluates the impact of individual determinant, and column p-value shows significance.

Furthermore, it was tested whether the created linear model is appropriate and whether it explains well the dependence of individual determinants on the capital structure. Resulting value of test criterion ($F = 16.56$ with p-value = 0) confirmed the quality for the presented model. But with the index of determination $R^2 = 0.1177$, this model is insufficient for prediction making.

3.7 Summary of Results and Discussion

The first level of performed capital structure study is the analysis of the preferences for debt over equity in Czech enterprises financing. An analysis of the Czech environment as well as an analysis of individual industrial sectors was performed. We can conclude that Czech companies use equity rather than debt with only one exception of the CZ-NACE sector G.

This finding is consistent with the pecking order theory of Myers (1984) which can be stated as backgrounding capital structure theory valid in the Czech environment. This theory has two basic explanations. The first one is the effect of asymmetric information (Fisher & Donaldson, 1962), i.e., that financial managers of companies do not make completely rational decisions because they do not have enough information. For example, they are not aware of the utilisation of the tax shield in the case of debt, whereby debt is considered a cheaper form of financing than equity. According to Brealey and Myers (2014), asymmetric information favors the issue of internal resources over external ones. The second basic explanation is that Czech companies use equity, especially retained earnings, as long as they can because it

Fig. 4: Mutual relations between determinants

Graphical correlations between determinats
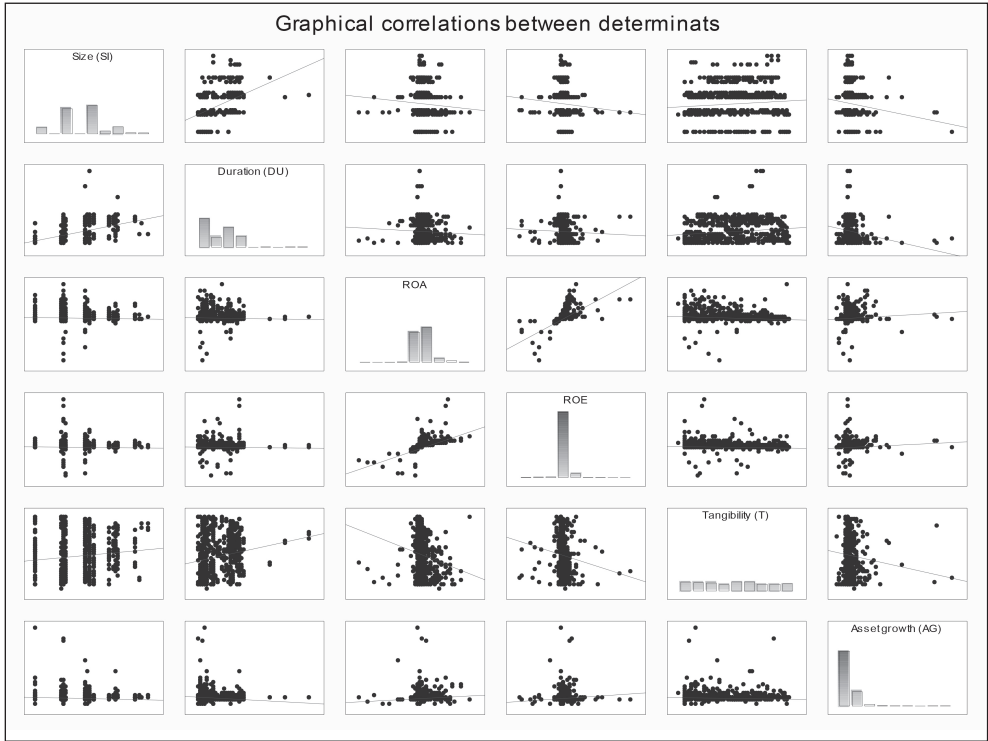
Source: own (Statistics 12 software)

Tab. 10: Linear regression model with all selected determinants

	Linear regression model of capital structure (CS) R = 0.343; R2 = 0.118; *N* = 752; *F*(6;745) = 16.561; *p*-value = 0					
	b*	Std. of b*	b	Std. of b	*t*(745)	*P*-value
Constant			0.387	0.028	13.969	0.000
Size	0.073	0.039	0.000	0.000	1.897	0.058
Duration	−0.111	0.039	−0.003	0.001	−2.824	0.005
ROA	−0.324	0.045	−0.605	0.084	−7.222	0.000
ROE	0.304	0.045	0.213	0.031	6.820	0.000
Tangibility	0.160	0.035	0.149	0.033	4.522	0.000
Asset growth	0.087	0.035	0.036	0.014	2.484	0.013

Source: own (Statistics 12 software)

is the most accessible form of financing but not the most advantageous. Contributions Frank and Goyal (2007), Yang et al. (2021), Delikanli (2020), Ngatno et al. (2021), and Czerwonka and Jaworski (2021) admit presented outcomes as well. The indebtedness threshold has been introduced by Kraus and Litzenberger (1973), who considered a balance between the DEA-weight costs of bankruptcy and the tax-saving benefits of debt. The modern finance theory, presented by Booth et al. (2001) or Fama and French (1999), stands against and criticises the pecking-order theory.

While most businesses across all sectors use more equity than debt, there is one industrial sector, where the ratio is reversed, the CZ-NACE sector G: Wholesale and retail trade, repair and maintenance of motor vehicles. This sector is specific as it is oriented mainly on services and not on manufacturing or processing. Wholesale and retail trades require high capital and investments, which is reflected in the increased need for debt.

The second level of our capital structure study, the core one, is the analysis and classification of significant capital structure determinants and their mutual relationships. As a first step, the whole dataset was cleaned from negative influences. All companies with negative equity were excluded because they do not behave rationally and according to economic rules for financing, and therefore, they were excluded from our research. Subsequently, sample characteristics and boxplot visualisation of individual determinants have been evaluated.

The power of dependence between indebtedness and selected capital structure determinant was calculated by a partial correlation coefficient that allows excluding the effect of other determinants. Pearson correlation test of linear independence helps us to reveal significant determinants. Selected determinants can be therefore classified and divided into four groups:
a) Strong significance (p-value < 0.001 and abs(partial correlation) ≥ 0.5);
b) Medium significance (p-value < 0.001 and abs(partial correlation) < 0.5);
c) Weak but still significant (p-value in between 0.001 and 0.05);
d) Not significant (p-value > 0.05).

None of the selected determinants is strongly significant.

Medium-significance determinants are profitability indicators and tangibility. Both profitability indicators (ROA and ROE) have an effect on the capital structure. While ROE has a positive effect on indebtedness, the ROA has the opposite effect. If we analyse profitability as the capital structure determinant, we reach the answer that ROA is a more suitable indicator. There are two reasons for this decision: ROE contains capital structure in its evaluation, and companies with low earnings have high indebtedness. ROE has a huge disadvantage; it is given by the fraction of earnings over equity and equity is a substantial part of capital structure. A low amount of own capital leads to greater debt and higher ROE values. Conversely, ROA acts more understandably when a lower ROA implies more debt. Interestingly, ROA behaves differently from ROE, although the two have a strong correlation with each other. The explanation is that a higher ROA means a higher profit and, therefore, more equity and less foreign capital, whereas, as has already been said, with a higher ROE comes greater debt. Profitability is classified as the significant determinant of capital structure by 22 studies, as previously summarised in Tab. 1. Ten of them even reveal its negative effect on indebtedness. Nevertheless, the majority of mentioned studies do not specify which profitability measure is utilised.

Tangibility has been classified as the medium significance determinant with a positive impact. It results from the need for additional capital for new investments, and companies with a higher share of fixed assets choose more foreign capital. Tangibility has been marked as significant by 15 studies. There is no agreement on the tangibility effect; the positive correlation is stated by Jaworski and Czerwonka (2021) or Frank and Goyal (2007), and conversely, the negative effect is confirmed by Balios et al. (2016) and Bauer (2004). Gurusamy (2021) classified tangibility as the non-significant determinant.

The weak but still significant group contains two determinants. The first is the determinant of asset growth, which affects indebtedness positively. This determinant confirmed that asset growth affects capital structure, which corresponds to the fact that expanding companies need more foreign capital. Asset growth has been presented as the significant capital structure determinant by 14 searched studies, and its positive effect has been proven by six of them (Tab. 1). Surprisingly, the current study by Gurusamy (2021) classified the asset growth effect as neglectable.

The behaviour of duration, the second weakly significant determinant, shows that older firms have more retained earnings and are therefore more likely to finance themselves with equity than with debt. Based on Tab. 1, duration is classified as significant by eight studies and its positive effect is revealed by Belas et al. (2018) and Prášilová (2012).

The not-significant group includes only one determinant – size. The size of the enterprise is not important when the Czech company is deciding on the capital structure. There exist just a small positive dependence of the company size on the indebtedness. The nonsignificance of company size is the outcome of other studies as well, e.g., Delikanli (2020) and Frank and Goyal (2007). Nevertheless, a myriad of studies classifies size as the significant determinant. The most recent ones are Chandra et al. (2021), Gurusamy (2021), Fenyves et al. (2020), Dokulil et al. (2020), and Menon et al. (2020). Positive dependence on company size is shown by Jaworski and Czerwonka (2021), Balios et al. (2016), Bayrakdoroglu et al. (2013), and Bauer (2004). On the other hand, the negative correlation between size and indebtedness is the outcome of Dawar (2014) and Prášilová (2012).

In the third and the last level of performed capital structure study, a linear regression model has been built and the relationships between individual determinants have been examined. Fisher *F*-test confirmed model suitability; nevertheless, the value of the index of determination shows that this model is inappropriate for prediction making. The mutual relationship between ROA and ROE was explained in the previous paragraph. Other strongly correlated determinants are duration and size. Businesses usually expand over time; therefore, older businesses tend to be larger. As a capital structure determinant duration should be preferred over size, because of the low influence of size on indebtedness. In addition, it was found that the determinants of tangibility and asset growth have a mutual relationship with all other determinants. As they are dependent on other determinants, their utilisation can negatively affect regression analysis results. It was investigated whether their adding or omission would affect our regression results and luckily both models were identical in suitability and prediction power.

Last but not least, a set of recommendations for the financial managers and creditors is presented.

1. Financial managers should include more debt financing in the capital structure due to the possibility of tax shield utilisation.

One of our findings states that Czech companies prefer equity over debt. However, equity is generally more expensive capital than debt and due to information asymmetry enterprise managers do not know about it. Costs of equity are the so-called implicit opportunity costs and they are not apparent in the financial statements, unlike, for example, the interest on loans. Opportunity cost also includes utility or economic benefit and individual loss. Studies like this can provide strong information to financial managers and therefore, they will benefit from cheaper foreign capital more efficiently.

2. Creditors should search through signals indicating high indebtedness.

High indebtedness of a company can be expected, when its ROA is low and tangibility together with asset growth are high, as our analyses prove. Tangibility is defined by the high share of fixed assets in total assets. The length of time on the market also affects the company's capital structure. For example, start-ups tend to have more debt than older companies, cause they can utilise their retained earnings. The effect of the size is not significant in the Czech environment.

Conclusions

Optimal capital structure, as a strategic task for financial management, creates the ground for the development and stability of any enterprise. The main aim of this contribution is to reveal and classify significant determinants of capital structure in the Czech environment.

As a first step, we are performing analyses of the general behaviour of Czech companies and specific sectorwise behaviour. Stated hypotheses based on the trade-off theory are rejected; only the sector of wholesale and retail trades acts inversely. Czech companies prefer equity over debt financing. This corresponds to the pecking order theory expecting preferential use of retained earnings. To financial managers, we can recommend considering tax shield utilisation and including more debt in the capital structure. Due to information asymmetry, companies prefer more expensive equity.

The most important part of our contribution is devoted to the capital structure determinants. We select the six most frequent determinants for previous capital structure studies: size,

profitability (ROA, ROE), tangibility, asset growth, sector, and duration; and we classify them by their power of dependence with capital structure. Moreover, we analyse mutual relations of determinants and their positive respectively a negative effect on indebtedness.

To sum up our outcomes, the Czech environment capital structure is substantially determined by tangibility and profit characteristics. We consider ROA to be a more appropriate capital structure determinant than ROE because a higher ROA means a higher profit. Debt financing is preferred by enterprises with lower ROA. Analysed determinants are strongly correlated with each other; for example, there is a significant dependence between company size and its age, and between ROA and ROE. Asset growth has a middle strong dependence on all other determinants; therefore, it should not be used together with other determinants.

Our study is limited by the dataset period and we are not taking into account financial statements during the covid crisis (2020 till now). Nevertheless, it benefits this study as well, and significant determinants of capital structure in the Czech environment are revealed in stabilised economic growth. The following research will be focused on individual business sectors. We already proved that wholesale and retail trades act differently from other enterprises. We will perform advanced sectorwise analyses of significant capital structure determinants and we could add indebtedness and bankruptcy modelling as well.

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