The Determinants of Capital Structure: Evidence from Russia

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Abstract

This study aims to identify the capital structure determinants of the listed Russian firms. In addition, this article reviews the current capital structure theories and how they can be applied to the decision-making processes for choosing a capital structure. The determinants are the factors that would affect a firm's financial leverage. The study was based on a sample of 48 publicly traded non-financial firms with the same financial reporting standards over the period of 2009–2015. The final data set excludes firms with missing data for the selected variables of any year and firms with outliers. The following variables were selected to determine the factors that would influence a firm's capital structure: business risk, profitability, firm size, growth opportunities, growth opportunities, tangibility, uniqueness, average tax rate, non-debt tax shields, industry mean leverage, stock market return, average lending rate and inflation rate. The random-effects model was employed for estimations while the OLS approach was used to measure the impact of industry on capital structure. It was found that the most significant capital structure determinants of Russian firms are industry mean leverage, firm size with a positive effect and growth opportunities with a negative one. Profitability, non-debt tax shields and stock market conditions with a negative impact were less important. The determinants which were concluded to be irrelevant were business risk, growth opportunity measured as capital expenditures to total assets, tangibility of assets, uniqueness of assets, average tax rate, the industry group of Energy firms, lending, and inflation rates. Another finding was that the Oil & Gas and Metal firms tended to have a lower debt level compared to firms from other industries.

Keywords: capital structure, leverage, capital structure determinants, panel data analysis, OLS.

JEL: G30, G32

Introduction

Capital structure is defined as the combination of equity and debt that a firm uses to finance its assets. Firms make a number of decisions regarding their choice of capital structure such as the kind of debt, the amount of debt, and the stockholders contributions. It is assumed that firms tend to make wise financial decisions in order to increase their value, which is why researchers continue to study the optimal capital structure for firms.

The capital structure determinants that are commonly used for such an analysis are firm size, profitability, growth opportunity with different kinds of measures, tangibility and uniqueness of assets, tax rates and macroeconomic determinants (debt market conditions, inflation, etc.).

Modigliani and Miller (1958) suggested that there is no relationship between a firm's value and a firm's financing in an efficient market (no taxes, agency or bankruptcy costs, information asymmetry). On the other hand, the level of debt positively affects a firm's value if taxes and costs exist. The tax shield values increase as a firm attracts more debt. This is one of the main suggestions of the current capital structure conception.

The impact of growth opportunities on the level of debt was one of the variables focused on in the study mentioned above [Myers, 1977]. Managers and owners make decisions considering the agency costs and trade-off while having to choose between internal debt and external debt and equity [Jensen, Meckling, 1976]. Another point is that an increase in debt would mean a higher firm value, which could be seen as a message to investors. Generally, firms prefer to use their internal funds for operations and to attract debt only if they have to look for external financing [Myers, Majluf, 1984].

This theoretical framework proposed a number of determinants that were employed in empirical studies mainly for developed economies [Rajan, Zingales, 1995; Titman, Wessels, 1988]. Recent studies have provided results for the developing economies of Egypt [Eldomiaty, 2007], Jordania [Khrawish, Khraiwesh, 2010], Russia [Ivashkovskaya, Solntseva, 2007; Sheluntcova, 2014; Makeeva, Kozenkova, 2015], Serbia [Malinić, Denčić-Mihajlov, Ljubenović, 2013], Turkey [Acaravci, 2015] and Vietnam [Dung, 2015].

The sample of publicly traded Russian companies is particularly interesting because of the country's specific economy. The macroeconomic conditions of the country change frequently due to changes in commodity prices and political and economic sanctions. The sample covered both stable and unstable periods in the Russian economy that provide more insight into the subject being studied. Furthermore, the study employed a wide range of determinants that are rarely incorporated into one model (e.g. business risk, uniqueness of assets, macroeconomic conditions and industry groups). In addition, four leverage determinants were used in order to analyse the data more exhaustively employing improved methods for panel data analysis.

It is evident that further empirical research of capital structure determinants for firms operating in developing economies is needed due to their less efficient capital markets and information asymmetry. This is the reason why the currently accepted theories could not fully be applied to capital structure of Russian firms. Hence, studying the capital structure determinants of Russian firms is very important as it explains the behaviour of a firm when they are making financial decisions and allows for the comparison of results the obtained here with the ones for the developed economies.

Literature review

Theoretical framework

Trade-off theory, agency theory, free cash flow theory

The trade-off models developed for selecting optimal debt-equity measures provided the basis for the capital structure theories. The trade-off between tax-advantage as a measure of debt tax shields, financial distress (debt associated costs) and bankruptcy costs were considered [Bradley, Jarrell, Kim, 1984]. It was proposed that firms with lower tax advantages and higher bankruptcy costs tend to use less debt. Firms find the optimal capital structure which balances the debt tax shield and financial distress costs [Myers, 1984]. Another point was that firms achieve the optimal capital structure with the lowest agency costs for the current debt level [Jensen, Meckling, 1976]. In the case of firms generating strong free cash flows, debt makes managers pay out cash flows instead of making inefficient investments that would finally lead to substantial dividends [Jensen, 1986].

Pecking-order and market-timing theories

It was also found that firms prefer to use internal funds because they tend to attract debt over equity when seeking external funds. Outsiders can see these signals based on the manager's actions when an equity issuing would mean stock overvaluation, while a usage increase in debt could signal confidence in a firm's future [Myers, Majluf, 1984]. The pecking-order theory states that leverage is set up by a need in the external funds and not the optimal capital structure. Therefore, this makes it unlikely to be able to define the target debt ratio for a firm. Timing would be applied to the firm's actions in order to maximize the stock value based on the market conditions for different time periods. Firms with a low leverage prefer to attract debt expecting a high market valuation for the firm, while high leverage ones act inversely [Baker, Wurgler, 2002]. Debt attraction is strongly dependent on the needs of the firm and is related to equity and the debt market conditions. It does not allow for a clear definition of the optimal capital structure as well.

Empirical studies

There are a number of empirical studies that cover the US firms including a sample of 851 firms over the period of 1962–1981 [Bradley, Jarrell, Kim, 1984]; 469 firms over

the period of 1976–1982 [Titman, Wessels, 1988], 545 firms over the period of 1978–1980 [Long, Malitz, 1985] and a large number of firms over the period of 1950–2003 [Frank, Goyal, 2009]. Titman and Wessels (1988) showed that transaction costs, uniqueness of assets and firm size are significant determinants that influence capital structure while volatility, future growth, collateral value and non-debt tax shields are non-influential ones. Another study showed that there were determinants that relate to the market-based leverage including tangibility of assets, profitability, firm size, industry mean leverage, growth and inflation [Frank, Goyal, 2009].

The cross-country studies started with an analysis of the capital structure determinants in the US, Japan, France, the Netherlands and Norway [Toy, 1974]. It was extended by Rajan and Zingales (1995) who studied a sample of publicly traded firms from seven of the most developed economies. Then, Chen et al. [Chen, Lensink, Sterken, 1998] tested the applications of the main theories on the capital structure definition of the firms from the Netherlands. A positive effect on profitability and tangibility and a negative effect on firm size and growth opportunities were identified for the publicly traded Canadian firms listed on Toronto Stock Exchange over the period of 1996–2004 [Nunkoo, Boateng, 2010].

In regard to the economies of the developing countries, the significant positive determinants for a sample of industrial Jordanian companies listed on Amman Stock Exchange (2001–2005) were size, tangibility and the negative determinant was profitability [Khrawish, Khraiwesh, 2010].

For the listed Serbian firms, the capital structure determinants were studied using panel data. The findings indicated that these firms tend to have a lower debt ratio and that they rely more heavily on short-term debt rather than long-term debt when compared to firms from other transitional economies. The study also indicated that there was a significant negative impact on liquidity, tangibility, profitability and cash gap on the debt ratios. The leverage level of Serbian firms was positively affected by income volatility and growth opportunities [Malinić, Denčić-Mihajlov, Ljubenović, 2013].

The study of Central and Eastern Europe firms tested the characteristics of the firms that affected the capital structure of micro, small, and medium-sized firms. A panel data analysis of 3175 firms from seven countries during the period of 2001–2005 showed that there was a significant and strongly negative relationship between profitability and leverage. Future growth opportunities, liquidity, sales growth, size and assets structure, and cash flow were also important determinants of firm leverage, while they could differ depending on the firm's size and age. The cash flow coefficient was negative and statistically significant only for the medium-sized firms, which suggested that larger firms with sufficient internal funds tend to use less external funding than the smaller ones [Mateev, Poutziouris, Ivanov, 2013].

Another work used the panel data approach to study the capital structure determinants in Turkey. The sample for this study included 79 manufacturing firms, which were listed on the Istanbul Stock Exchange from 1993 to 2010. A significant relationship between growth opportunities, size, profitability, tangibility and leverage variables was seen, while the non-debt tax shield variable had an insignificant effect on firm leverage [Acaravci, 2015].

An extensive study was performed on the firms listed on the Vietnamese stock exchange. The panel data analysis methods were used for a sample of 183 non-financial publicly traded firms from 2009 to 2013. This study identified that the important factors determining the use of debt by the listed Vietnamese firms were those of firm size, inflation rate, tangibility, business risk and stock market return. These were followed by the moderately influential determinants, which included profitability, growth opportunities, industry mean leverage, average lending rate and uniqueness of assets. In addition, strong evidence of a higher debt level was found for the firms belonging to the Construction, Construction Materials, Real Estate industries and Mineral industries, being followed by the Manufacturing, Steel and Plastics and Packaging industries [Dung, 2015].

Another capital structure study covered the Baltic countries and Russia. An analysis of both the macroeconomic and microeconomic variables over the period of 2002–2008 showed that the determinants that influenced capital structure choice were generally similar with some of the significant differences across the studied countries. Liquidity was an important determinant in all the Baltic States, especially for the short-term leverage and Trade Credit/Total Assets models. Tangibility was the only significant determinant in the firm-related models, especially the long-term leverage ones for all sampled countries. The author found that Russian companies tend to take more debt, especially long-term debt especially, when the company has a higher business risk. Profitability and stock market development were also important determinants of the capital structure of Russian firms [Tamulyte, 2012].

One of the studies from Russia was devoted to testing the trade-off theory versus the pecking-order theory. The analysis showed consistency in both theories. However, the pecking-order theory worked better for the firms controlled by the government while the trade-off theory explained other firms' behaviour more precisely. For public companies, both theories proved to be correct with a clear predominance of the pecking-order theory. For the private firms, only the trade-off theory was able to explain the choice of capital structure, while the pecking-order theory was rejected for all models [Ivashkovskaya, Solntseva, 2007].

The capital structure of private pharmaceutical firms in Russia was studied based on a sample of 144 firms over the period of 2006–2011. It was found that firm size, profitability, assets structure and short-term liquidity were negatively related to debt ratio. It was also discovered that the economic crisis had significantly influenced firms' financial decisions in the Russian pharmaceutical industry from 2010–2011 [Sheluntcova, 2014].

Another work studied the influence of taxes on the capital structure of Russian firms employing the Graham model. The authors found that an effective tax rate performed better than a marginal tax rate for the companies sampled. The results of the study were positive, with almost significant coefficients that confirmed most of the hypotheses regarding the influence of probability of bankruptcy, fixed assets and an effective tax rate [Makeeva, Kozenkova, 2015].

Based on the existing literature and available data, the following potential determinants of capital structure were analysed in this study (Table1). The table presents the proposed determinants and their predicted effects according to the available literature.

Table 1. Proposed determinants of capital structure

Determinants	Effects	Evidence
Business risk	- (Trade-off theory) + (Pecking-order theory)	Bauer, 2004; Dung, 2015; Frank, Goyal, 2009; Titman, Wessels, 1988
Profitability	- (Pecking-order theory) + (Trade-off theory, Agency theory, Free Cash Flow theory)	Ivashkovskaya, Solntseva, 2007; Jensen, 1986; Myers, Majluf, 1984; Rajan, Zingales, 1995; Sheluntcova, 2014
Firm size	- (Pecking-order theory) + (Trade-off theory)	Frank, Goyal, 2009; Ivashkovskaya, Solntseva, 2007; Nunkoo, Boateng, 2010; Sheluntcova, 2014; Titman, Wessels, 1988
Growth opportunities	- (Trade-off theory, Agency theory, Free Cash Flow theory) + (Pecking-order theory)	Dung, 2015; Malinić, Denčić-Mihajlov, Ljubenović, 2013; Myers, Majluf, 1984; Smith, Watts, 1992
Tangibility	-/+ (Pecking-order theory) + (Trade-off theory, Agency theory)	Bradley, Jarrell, Kim, 1984; Cortez, Susanto, 2012; Frank, Goyal, 2009; Ivashkovskaya, Solntseva, 2007; Long, Malitz, 1985; Malinić, Denčić-Mihajlov, Ljubenović, 2013
Uniqueness	-/+ (Pecking-order theory) - (Trade-off theory, Agency theory)	Dung, 2015; Titman, 1984; Titman, Wessels, 1988
Average tax rate	+ (Trade-off theory)	Bauer, 2004; Cortez, Susanto, 2012; DeAngelo, Masulis, 1980; Ivashkovskaya, Solntseva, 2007; Myers, 1984;
Non-debt tax shields	- (Trade-off theory)	
Industry mean leverage	n/a	Bradley, Jarrell, Kim, 1984; Frank, Goyal, 2009; Harris, Raviv, 1995; Long, Malitz, 1985
Stock market return	- (Market Timing theory)	Baker, Wurgler, 2002; Graham, Harvey, 2001; Welch, 2004
Average lending rate	- (Pecking-order theory, Market Timing theory) + (Trade-off theory, Agency theory)	Barry, 2008; Dung, 2015; Kaya, 2013; Taggart, 1977
Inflation rate	- (Pecking-order theory) + (Trade-off theory, Market Timing theory)	Dung, 2015; Frank, Goyal, 2009; Taggart, 1985

Methodology

The leverage variables and their calculations are presented in Table 2.

Table 2. Leverage measures

Proxy	Variable	Calculation
TLMV	Total Debt to Market Value (MV) of Capital	= Total Debt / (Total Debt + MV of Equity)
TLBV	Total Debt to Book Value (BV) of Capital	= Total Debt / (Total Debt + BV of Equity)
LLMV	Long-term Debt to MV of Capital	= Long-term Debt / (Total Debt + MV of Equity)
LLBV	Long-term Debt to BV of Capital	= Long-term Debt / (Total Debt + BV of Equity)

Table 3 shows the proposed capital structure determinants and their calculations.

Table 3. Measures of capital structure determinants

Determinant	Proxy	Calculation
Business risk	BRIS	Three-year rolling Standard Deviation of ROA
Profitability	PROF	EBIT/Total Assets
Firm size	SIZE	Log (Total Assets)
Growth opportunities	GROP	MV of Assets/BV of Assets; MV of Assets = MV of Equity + BV of Liabilities
Growth opportunities	CAPX	Capital expenditures/Total Assets
Tangibility	TANG	Net Property, Plant and Equipment/Total Assets
Uniqueness	UNIQ	Selling, General and Administration Expense/Net Sales
Average tax rate	TAXR	Tax expenses/Earnings before Taxes
Non-debt tax shields	NDTS	Depreciation expense/Total Assets
Industry Mean Leverage	ILEV	Industry average debt to capital ratio
Industry classification	IND1	=1 if firm belongs to Oil & Gas industry; 0=otherwise
Industry classification	IND2	=1 if firm belongs to Steel industry; 0=otherwise
Industry classification	IND3	=1 if firm belongs to Energy industry; 0=otherwise
Stock market return	MRTR	Yearly return of MICEX Index
Average lending rate	LENR	Yearly average lending rate of Russian credit organizations
Inflation rate	INFR	Yearly inflation rate of Russian economy

Industry dummy variables were employed in order to show the independent industrial effect of some industries on firm leverage. As a rule, the Oil & Gas, Steel and Energy firms are regulated by special laws and are state-owned. This would be the signal that these firms tend to attract more or less debt than other firms.

The study used panel data to analyze the determinants that would affect a firm's financial decisions. Descriptive statistics were employed to reveal the capital structure features and financial activities of the publicly traded Russian firms. Correlation analysis was used to find the relationship between each pair of variables. Linear regressions were performed in order to identify the determinants that can interpret the capital structure decisions of the sampled firms.

T fixed-effects model (FEM) and the random-effects model (REM) are usually used for panel data estimations. The FEM explores the relationship between the explanatory variables and the dependent variables within an entity, such as a firm, and removes the effect of time-invariant characteristics pertaining to the entity in order to assess the net effect of the explanatory variables on the dependent variable. Unlike the FEM, the REM assumes that the variation across entities is random and not correlated to any explanatory variables in the model allowing for time-invariant variables to have an effect on the dependent variable.

Since dummy variables were employed in this study, the FEM could not perform a regression on such variables because the industry dummies for each firm are time-invariant; while the REM allows for the presence of the dummy variables, assuming that the individual specific effects are not correlated to the independent variables. However, the REM will encounter an estimation bias with such an assumption. Therefore, regressions were run with both the FEM and the REM on the independent variables without industry dummies. After that, the Hausman test was used to detect which model worked better for the analysis. Finally, the pooled Ordinary Least Squares (OLS) regressions were performed to assess the effect of industry classifications. This method generates simple linear regression models on the whole data set while ignoring the panel structure of the data and allowing the presence of industry dummy variables in the model.

Panel data regressions were conducted using Gretl software. Data were grouped into their respective sources and listed according to their respective time periods. Regressions were run for each dependent variable and all independent variables excluding industry dummy variables.

As the appropriate model was found, regressions with the selected method were conducted for all four leverage measures in order to evaluate the degree and scope of the impacts of the capital structure determinants on each measure. The required tests were used to determine any regression issues (e.g. heteroscedasticity) with the selected models.

The general equation for the model that shows which determinants influence the capital structure decisions:

$$LEV_{it} = \alpha + \beta_1 D_{1\,it} + \beta_2 D_{2\,it} + \ldots + \beta_n D_{n\,it} + \varepsilon$$

Where LEV_{it} – leverage ratio observed for firm *i* at time *t*; D_{it} – determinant affecting firm *i* observed at time *t*; α – intercept of regression model; β – coefficient for each explanatory variable; ε – random statistical errors (or disturbance) of the model representing other determinants that influence a firm's capital structure but had not yet been covered in this study.

Data

The sample was based on the data of publicly traded Russian firms over the period of 2009–2015. The firms were selected according to the following criteria: 1) the financial services firms were excluded because specific financial industry regulations apply to the firms' liabilities; 2) the firms with missing data on relevant variables for any year of the period were excluded; 3) firms with outliers (extreme observations) of any variables were excluded because of a possible bias in the results. Despite an abundant amount of data available for the listed Russian firms, it was still difficult to create a complete sample that would meet the selection criteria. This was the reason for the rather limited number of firms.

The study employed panel data for 48 firms over a period of 336 observations in total. Yearly financial data was obtained from Morningstar's dataset, Bureau van Dijk's Ruslana dataset and the firms' published financial statements. Data from 2008 and 2016 was collected in order to calculate some explanatory variables.

Results

Descriptive statistics

Table 4 presents the descriptive statistics data for the sampled firms. It can be observed that non-financial Russian firms are highly indebted on the average (37.63% for the TLMV and 35.35% for the TLBV). The ratio of long-term debt varied from 23.99% to 25.53% showing that the main portion of total debt was comprised of long-term debt. The standard deviation coefficients indicated that the variation in debt usage was large among the selected firms especially for the MV measures. The volatile market and larger fluctuations in short-term borrowing are possible reasons for such variations. It is worth to note that the maximum values were very high for all the leverage measures (99.84% for the TLMV, 96.59% for the TLBV, 96.38% for the LLMV and 89.62% for the LLBV). This indicates that some of the sampled firms' capital has practically no equity.

Table 4. Descriptive statistics (2009–2015)

Variable	Proxy	Obs	Mean	Std. Dev.	Min	Max
Total Debt to MV of capital	TLMV	336	0.3763	0.2826	0.0000	0.9984
Total Debt to BV of capital	TLBV	336	0.3535	0.2436	0.0000	0.9659
LT Debt to MV of capital	LLMV	336	0.2553	0.2265	0.0000	0.9638
LT Debt to MV of capital	LLBV	336	0.2399	0.1904	0.0000	0.8962
Business risk	BRIS	336	0.0561	0.0628	0.0001	0.5306
Profitability	PROF	336	0.0684	0.1210	-0.7004	0.5472
Firm size	SIZE	336	12.598	1.3661	8.334	16.652
Growth opportunities	GROP	336	1.1869	0.7898	0.0866	5.9499

Variable	Proxy	Obs	Mean	Std. Dev.	Min	Max
Capital Expenditure	CAPX	336	0.0889	0.0674	0.0000	0.6423
Tangibility	TANG	336	0.5401	0.2173	0.0251	0.9237
Uniqueness	UNIQ	336	0.0951	0.1065	0.0000	0.5496
Average tax rate	TAXR	336	0.2315	0.1815	0.0000	1.6191
Depreciation	NDTS	336	0.2693	0.2027	0.0000	0.9125
Industry mean leverage	ILEV	336	0.2662	0.1551	0.0000	0.8514
Stock market return	MRTR	336	0.2193	0.4298	-0.1693	1.2114
Average lending rate	LENR	336	0.1143	0.0273	0.0846	0.1572
Inflation rate	INFR	336	0.0871	0.0243	0.0610	0.1291

Table 5 demonstrates the mean values of all the leverage ratios and the proposed capital structure determinants as an average of 48 firms from each year in order to see the changes in these measures during the study period.

All total debt measures increased notably during the period from 2014 to 2015 while the increase in the long-term debt was not as steep. The average TLMV in 2014 is 45.74%, a 23.66% increase compared to that of 2013. The average TLBV in 2014 is 42.53%, which was 30.14% higher than in 2013. It is interesting that an increase in the debt of the listed Russian firms happened during a tiny up-trend in the stock market that did not also lead to a lower capital MV. The results for long-term leverage indicated a generally stable growth in their values. The average LLMV increased to 34.99% over the period while the rise in LLBV was 73.22%. This denotes that the studied firms are more levered with long-term debt in terms of BV. Another tendency was that the portion of long-term debt to total debt increased to 20.34% in capital MV and to 28.25% in capital BV. This contradicts the suggestion that credit organizations prefer to make short-term loans during economic downturns as this was also observed in other developing countries.

Business risk fluctuated significantly during the study period from 3.94% in 2009 to 7.35% in 2014. This can be explained by the fact that a firm's ability to generate earnings changes over time and in conjunction with economic cycles.

Profitability decreased dramatically from its peak in 2011 at 11.76% down to 3.69% in 2015. Such a decrease in profitability could reflect the negative impact of low commodity prices and economic sanctions on a firm's performance. On the other hand, the decrease could be explained in part by the growth in firm size (from 12.207 in 2009 to 12.918 in 2015).

The average value of growth opportunities fluctuated between 1.07–1.50 over the study period with a clear downtrend starting in 2011. This indicates a lower growth prospect over the last five years. The listed Russian firms, on average, made less new capital expenditure per unit of asset. The average capital expenditures decreased from 8.75% in 2009 to 7.83% in 2015 with a peak of 10.22% in 2016. This would also signal the existence of limited growth opportunities.

The tangibility of assets decreased slightly on average during the study period: from 55.31% in 2009 to 52.34% in 2015. Meanwhile, the ratio of uniqueness increased from 8.99% in 2009 to 9.57% in 2015. This would indicate that the increased SGA spending lead to organizational inefficiencies or to investments in more intangible assets.

The average tax rate decreased notably from 27.15% in 2009 to 19.24% in 2015. This would indicate that the government had made efforts to support firms during the tougher economic environment. Meanwhile, the non-debt tax shields measure increased significantly as well. In this case, firms would not benefit more from debt tax shields.

The mean industry leverage values were moving in the same direction as the leverage measures. It increased from 24.01% in 2009 to 33.63% in 2015, with a sharp increase in 2014.

The stock market rate of return fluctuated greatly across the years from its lowest at 16.09% in 2011 to its highest at 121.14% in 2009. This reflects the highly volatile stock market conditions in Russia. The average lending rate ranged from 8.46% in 2011 to 15.72% in 2015. The inflation rate increased from 6.10% in 2011 to 12.91% in 2015. Both the inflation and lending rates were in the similar trend over this period.

Table 5. Means of variables

Variable	Proxy	2009	2010	2011	2012	2013	2014	2015
Total Debt to MV of capital	TLMV	0.3781	0.3197	0.341	0.3452	0.3699	0.4574	0.4241
Total Debt to BV of capital	TLBV	0.3249	0.3178	0.3072	0.3339	0.3268	0.4253	0.4388
LT Debt to MV of capital	LLMV	0.2152	0.2199	0.242	0.256	0.2766	0.2866	0.2905
LT Debt to MV of capital	LLBV	0.1807	0.227	0.2201	0.2417	0.2392	0.2576	0.313
Business risk	BRIS	0.0394	0.052	0.046	0.0539	0.0687	0.0735	0.0595
Profitability	PROF	0.0619	0.0925	0.1176	0.0843	0.0547	0.031	0.0369
Firm size	SIZE	12.207	12.422	12.469	12.636	12.693	12.843	12.918
Growth opportunities	GROP	1.2567	1.5002	1.1544	1.1566	1.0726	1.0676	1.1005
Capital Expenditure	CAPX	0.0875	0.0968	0.0953	0.1022	0.0823	0.0802	0.0783
Tangibility	TANG	0.5531	0.5424	0.5357	0.5460	0.5484	0.5317	0.5235
Uniqueness	UNIQ	0.0899	0.102	0.0966	0.0939	0.0986	0.0891	0.0957
Average tax rate	TAXR	0.2715	0.2416	0.2417	0.229	0.2149	0.2297	0.1924
Depreciation	NDTS	0.2239	0.2257	0.2041	0.2622	0.2949	0.3248	0.3495
Industry mean leverage	ILEV	0.2401	0.226	0.2273	0.2729	0.2463	0.3146	0.3363
Stock market return	MRTR	1.2114	0.2321	-0.169	0.0517	0.0199	-0.071	0.2612
Average lending rate	LENR	0.1531	0.1082	0.0846	0.091	0.0947	0.1114	0.1572
Inflation rate	INFR	0.088	0.0878	0.061	0.0658	0.0645	0.1136	0.1291

Correlation test results

Table 6 presents the correlation matrix between the leverage ratios and determinants, demonstrating how each pair of variables are related to one another.

The correlation coefficients between the TLMV and the TLBV, and between the LLMV and the LLBV were moderate with the values of 56% and 65% respectively. This means that the capital MV and capital BV were not highly correlated or fairly consistent in measuring leverage.

Business risk had a statistically significant positive relation to all leverage ratios except the LLMV, while the correlation coefficients were low (from 13% for the TLMV to 22% for the TLBV). This relationship is not supported by the trade-off theory, which states that firms borrow less when the business risk increases due to the higher expected costs of financial distress.

Profitability is negatively correlated with all leverage ratios at $\alpha = 0.01$ with moderate coefficients (from -25% in the LLMV and the LLBV and -38% in the TLMV and the TLBV). This suggests that profitability is likely to have an inverse influence on debt ratios, matching the sign predicted by the pecking-order theory.

Firm size was positively related to three leverage ratios but the relationships were not statistically significant except for the LLMV. This result is unlikely to apply to the trade-off theory in that larger firms are more stable with a low business risk, so they have a higher leverage than small firms, while contradicting the agency and the pecking-order theories in that larger firms have a lower degree of information asymmetry and more retained cash causing them to use less debt.

The determinant for growth opportunities was negatively correlated with the leverage ratios in terms of the MV at significance levels (-38% for the LLMV and -43% for the LLBV). This corresponds to the trade-off theory and the agency theory predictions that the firms with more growth opportunities have higher expected costs during financial distress and bear more agency costs using equity financing and reducing leverage. Another measure of growth opportunities (CAPX) was negatively related to the same ratios but not significantly.

The tangibility of assets had a mixed relation to two leverage ratios at $\alpha = 0.05$ with low coefficients (from -3% for the TLBV to 12% for the LLMV). This cannot clearly contribute to the assumption that firms who have more tangible assets can borrow more easily because they have lower costs during financial distress and fewer debt-related agency problems leading to higher leverage. The determinant of uniqueness demonstrates some positive significant correlations (from 14%for the LLBV and 16% for the TLBV), which does not correspond to the trade-off theory which says that the more unique firm assets result in a higher cost of financial distress.

The determinant for tax expense did not have a statistically significant relationship with leverage measures. The ratio of depreciation expense to total assets correlated positively with all leverage measures, especially the long-term ones that were significant at α = 0.01, while the coefficients ranged from 10% for the TLBV to 19% for the TLMV. The results contradict the predicted negative sign from the trade-off theory.

The industry mean leverage and all leverage ratios vary in the same positive direction at α = 0.01 with relatively high coefficients (from 34% for the LLMV to 68% for the TLBV). This would suggest that firm leverage follows the industry mean leverage.

Inflation rate was the only macroeconomic determinant that correlated (positively) with leverage ratios at α = 0.01–0.05 except for the LLMV where the coefficients were low (12% for the TLMV and the LLBV and 19% for the TLBV). The results indicate that leverage ratios were unlikely to be influenced by both market and macroeconomic conditions as suggested by the market-timing theory.

Most of the industry dummy variables showed a weak to moderate correlation with leverage ratios at 0.01–0.05 significance levels and moved differently. A negative correlation was observed for the group of Oil & Gas firms except for the TLMV and Energy firms in terms of the BV measure of debt. The coefficients were positive for the group of Steel firms, which shows that capital structure can be affected by industry classifications and that firms belonging to the specified groups are levered more or less than the others.

Table 6. Correlation Matrix

	TLMV	TLBV	LLMV	LLBV	BRIS	PROF	SIZE	GROP	CAPX	TANG
TLMV	1.00									
TLBV	0.56***	1.00								
LLMV	0.84***	0.44***	1.00							
LLBV	0.48***	0.80***	0.65***	1.00						
BRIS	0.13**	0.22***	0.05	0.16***	1.00					
PROF	−0.38***	−0.38***	−0.25***	−0.25***	−0.40***	1.00				
SIZE	0.05	−0.08	0.17***	0.03	−0.15***	0.08	1.00			
GROP	−0.43***	0.08	−0.38***	0.04	0.11**	0.22***	−0.24***	1.00		
CAPX	−0.08	−0.04	−0.01	0.06	0.01	0.11**	−0.02	0.26***	1.00	
TANG	0.08	−0.13**	0.12**	−0.03	0.07	−0.12**	0.22***	−0.07	0.42***	1.00
UNIQ	−0.01	0.16**	−0.03	0.14***	0.05	0.05	−0.03	0.15***	−0.01	−0.20***
TAXR	0.04	−0.00	0.06	0.04	−0.17***	0.05	−0.04	−0.05	−0.07	−0.09*
NDTS	0.19**	0.10*	0.17***	0.15***	0.23***	−0.13**	0.10*	−0.12**	0.17***	0.30***
ILEV	0.43***	0.68***	0.34***	0.59***	0.25***	−0.28***	−0.11*	0.05	0.05	−0.01
MRTR	0.00	−0.03	−0.07	−0.09*	−0.10**	−0.04	0.10*	0.06	−0.01	0.02
LENR	0.08	0.11*	0.00	0.04	−0.03	−0.14**	−0.00	0.01	−0.07	−0.01
INFR	0.12**	0.19***	0.05	0.12**	0.06	−0.18***	0.09	−0.02	−0.08	−0.03
IND1	0.22***	−0.24***	−0.14**	−0.17***	−0.16***	0.25***	0.57***	−0.04	−0.01	0.09*
IND2	0.17**	0.27***	0.19***	0.27***	0.07	−0.13**	0.11**	−0.00	−0.15***	−0.12**
IND3	−0.02	−0.28***	0.04	−0.21***	−0.02	−0.21***	0.07	−0.16***	0.04	0.43***

Continued.

	UNIQ	TAXR	NDTS	ILEV	MRTR	LENR	INFR	IND1	IND2	IND3
UNIQ	1.00									
TAXR	−0.04	1.00								
NDTS	0.36***	0.00	1.00							
ILEV	0.12**	−0.02	0.27***	1.00						
MRTR	−0.01	0.07	−0.06	−0.04	1.00					
LENR	−0.01	−0.00	0.09	0.12**	0.74***	1.00				
INFR	−0.01	−0.05	0.18***	0.21***	0.18***	0.75***	1.00			
IND1	0.05	−0.05	−0.10*	−0.27***	−0.00	0.00	0.00	1.00		
IND2	0.13**	0.06	0.11**	0.44***	−0.00	0.00	0.00	−0.20***	1.00	
IND3	−0.40***	−0.02	−0.09*	−0.34***	0.00	0.00	0.00	−0.20***	−0.20***	1.00

Regression results

Table 7 shows the regression results based on the FEM for all leverage measures including the regression coefficients for each explanatory variable, their corresponding t-value, the statistical significance level of the coefficient and the value of R-squared for each regression model.

Table 7. Fixed-effects regression results

	TLMV	TLBV	LLMV	LLBV
Const	−0.475	−0.667***	−0.723**	−0.563**
	(0.394)	(0.224)	(0.335)	(0.265)
BRIS	0.419*	0.053	0.384*	0.084
	(0.236)	(0.135)	(0.201)	(0.159)
PROF	−0.321***	−0.334***	0.004	−0.091
	(0.123)	(0.069)	(0.104)	(0.082)
SIZE	0.052*	0.064***	0.066***	0.050**
	(0.029)	(0.016)	(0.025)	(0.019)
GROP	−0.147***	0.035***	−0.093***	0.023*
	(0.019)	(0.011)	(0.017)	(0.013)
CAPX	0.104	−0.134	0.159	0.082
	(0.201)	(0.115)	(0.171)	(0.136)
TANG	0.577***	−0.034	0.342**	−0.122
	(0.162)	(0.092)	(0.138)	(0.109)
UNIQ	−0.234	0.108	−0.219	0.028
	(0.201)	(0.114)	(0.170)	(0.135)
TAXR	0.019	0.011	−0.006	0.020
	(0.061)	(0.035)	(0.052)	(0.041)
NDTS	−0.136	−0.106*	−0.014	−0.078
	(0.098)	(0.056)	(0.083)	(0.066)
ILEV	0.491***	0.869***	0.387***	0.620***
	(0.125)	(0.071)	(0.106)	(0.084)

	TLMV	TLBV	LLMV	LLBV
MRTR	0.092	0.021	0.010	−0.078*
	(0.064)	(0.037)	(0.055)	(0.043)
LENR	−1.607	−0.342	−0.102	1.481
	(1.432)	(0.814)	(1.216)	(0.961)
INFR	1.521	0.461	−0.242	−1.072
	(1.092)	(0.621)	(0.927)	(0.733)
N	336	336	336	336
R^2 within	0.687	0.864	0.649	0.689
Standard errors in parentheses				
** p < 0.10; ** p < 0.05; *** p < 0.01*				

Table 8 demonstrates the regression results based on the REM for all leverage measures with the same specifications.

Table 8. Random-effects regression results

	TLMV	TLBV	LLMV	LLBV
Const	0.273	−0.254	−0.150	−0.311**
	(0.210)	(0.157)	(0.184)	(0.144)
BRIS	0.276	0.028	0.245	0.055
	(0.222)	(0.131)	(0.189)	(0.149)
PROF	−0.323***	−0.355***	−0.032	−0.128*
	(0.115)	(0.068)	(0.098)	(0.077)
SIZE	0.007	0.033***	0.028**	0.027**
	(0.015)	(0.012)	(0.013)	(0.010)
GROP	−0.151***	0.029***	−0.010***	0.015
	(0.018)	(0.011)	(0.015)	(0.012)
CAPX	0.061	−0.155	0.133	0.092
	(0.193)	(0.112)	(0.164)	(0.129)
TANG	0.158*	−0.106	0.102	−0.088
	(0.095)	(0.068)	(0.083)	(0.065)
UNIQ	0.029	0.159	−0.072	0.083
	(0.158)	(0.101)	(0.136)	(0.107)
TAXR	0.039	0.013	0.016	0.031
	(0.060)	(0.034)	(0.051)	(0.040)
NDTS	−0.099	−0.118**	−0.018	−0.065
	(0.085)	(0.052)	(0.072)	(0.057)
ILEV	0.628***	0.900***	0.458***	0.646***
	(0.104)	(0.065)	(0.089)	(0.070)
MRTR	0.088	0.005	−0.003	−0.089**
	(0.063)	(0.036)	(0.053)	(0.042)

	TLMV	TLBV	LLMV	LLBV
LENR	−1.703	−0.209	−0.046	1.564
	(1.432)	(0.814)	(1.211)	(0.955)
INFR	1.509	0.483	−0.225	−1.063
	(1.099)	(0.623)	(0.929)	(0.733)
N	336	336	336	336
R^2 overall	0.711	0.826	0.675	0.612
Standard errors in parentheses				
** p < 0.10; ** p < 0.05; *** p < 0.01*				

The Hausman test specifies that a null hypothesis cannot be rejected in all cases (Table 9). This was evidence that the REM is suitable for the panel data analysis in this study.

Table 9. Hausman test results

	TLMV	TLBV	LLMV	LLBV
Chi-square	17.0496	14.308	13.512	11.944
Prob > Chi2	0.197	0.353	0.409	0.532
H_0: random effects (GLS) estimates are consistent				

Table 10 provides the regression results of the REM with the statistically significant variables included.

Table 10. Random-effects regression with selected determinants

	TLMV	TLBV	LLMV	LLBV
Const	0.342***	−0.378***		
	(0.059)	(0.140)		
BRIS				
PROF	−0.384***	−0.375***		
	(0.106)	(0.063)		
SIZE		0.040***	0.025**	0.021**
		(0.011)	(0.012)	(0.010)
GROP	−0.146***	0.028***	−0.097***	
	(0.016)	(0.010)	(0.014)	
CAPX				
TANG				
UNIQ				
TAXR				
NDTS		−0.107**		
		(0.047)		
ILEV	0.612***	0.919***	0.465***	0.642***
	(0.096)	(0.063)	(0.078)	(0.066)

	TLMV	TLBV	LLMV	LLBV
MRTR				−0.026*
				(0.015)
LENR				
INFR				
N	336	336	336	336
R2 overall	0.709	0.832	0.665	0.598
Breusch-Pagan test (p-value)	3.821	2.326	6.747	4.229
Hausman test (p-value)	0.061	0.073	0.518	0.263
Standard errors in parentheses				
** p < 0.10; ** p < 0.05; *** p < 0.01*				

The *p*-values of both tests showed that there were no issues with heteroscedasticity and the models estimations were consistent, while the Hausman test coefficients looked suspicious for the TLMV and the TLBV models.

Based on the obtained results, one could find that the selected variables can explain 70.9% of the leverage variability measured as Total Debt to MV, 83.2% of the leverage variability measured as Total Debt to BV, 66.5% of the leverage variability measured as Long-term Debt to MV, and 59.8% of the leverage variability measured as Long-term Debt to BV that were high R-squared values.

Table 11 shows the heteroscedasticity-corrected OLS regression results with the industry dummies included (the original OLS results had heteroscedasticity problems). IND1 (Oil & Gas) and IND2 (Steel) were found to have a statistically significant influence on leverage ratios except for the LLBV, while IND3 (Energy) was revealed to have no significant influence on capital structure. All statistically significant coefficients were negative.

Table 11. Heteroscedasticity-corrected OLS regression results with industry dummies

	TLMV	TLBV	LLMV	LLBV
Const	0.008	0.021	−0.207**	−0.190**
	(0.119)	(0.108)	(0.089)	(0.089)
BRIS	0.055	−0.232**	−0.025	−0.008
	(0.121)	(0.107)	(0.118)	(0.085)
PROF	−0.307***	−0.589***	−0.133	−0.292***
	(0.085)	(0.051)	(0.087)	(0.078)
SIZE	0.027***	0.019**	0.032***	0.019***
	(0.008)	(0.007)	(0.006)	(0.006)
GROP	−0.140***	0.045***	−0.084***	0.014**
	(0.012)	(0.010)	(0.010)	(0.007)
CAPX	−0.120	−0.086	0.020	0.106
	(0.136)	(0.163)	(0.095)	(0.078)
TANG	0.028	−0.107**	0.041	−0.003
	(0.052)	(0.043)	(0.035)	(0.036)
UNIQ	0.135*	0.143**	0.154***	0.210***
	(0.073)	(0.057)	(0.057)	(0.064)

	TLMV	TLBV	LLMV	LLBV
TAXR	0.028	0.084**	0.015	0.044
	(0.056)	(0.038)	(0.030)	(0.039)
NDTS	–0.133**	–0.134**	–0.117***	–0.133***
	(0.066)	(0.056)	(0.045)	(0.046)
ILEV	0.627***	0.941***	0.585***	0.770***
	(0.078)	(0.057)	(0.056)	(0.058)
IND1	–0.099***	–0.067**	–0.051**	–0.033
	(0.030)	(0.027)	(0.024)	(0.024)
IND2	–0.095***	–0.098***	–0.069***	–0.029
	(0.031)	(0.023)	(0.026)	(0.027)
IND3	0.011	–0.031	0.041	0.004
	(0.036)	(0.029)	(0.027)	(0.022)
MRTR	0.001	0.008	0.022	–0.014
	(0.051)	(0.046)	(0.042)	(0.040)
LENR	0.187	–0.391	–0.832	–0.204
	(1.136)	(1.087)	(0.949)	(0.973)
INFR	0.482	–0.059	0.964	0.238
	(0.855)	(0.787)	(0.713)	(0.726)
N	336	336	336	336
R^2	0.589	0.723	0.552	0.512

Standard errors in parentheses

** p < 0.10; ** p < 0.05; *** p < 0.01*

Table 12 summarizes the main analysis findings of the capital structure determinants of Russian firms.

The five most important and reliable determinants affecting the capital structure of listed Russian firms were identified. These were the determinants that had statistically significant influences on three or four of the leverage measures at α = 0.01–0.05. The group of highly influential determinants includes firm size, growth opportunities, industry mean leverage and the groups of Oil & Gas and Steel firms. Firm size had a positive impact on the leverage of the sample firms, which rests on the premise of the trade-off theory. Growth opportunity impacted leverage differently in that it was negative in terms of the MV (Trade-off theory, Agency theory, Free Cash Flow theory) and positive for the TLMV (pecking-order theory). It was also found that the industry classification for the Oil & Gas industry (IND1) and Steel (IND2) had a negative relationship with firm leverage, indicating that the firms belonging to these industries have a lower leverage than the others.

The study also identified the determinants that influenced one or two leverage ratios at α = 0.01–0.10. Profitability had a negative impact on the leverage of the firms in the study for the total debt measures, showing that profitability primarily influences the short-term debt of firms. This is consistent with the pecking-order theory. The determinant of non-debt tax shields was negatively related to leverage of the firms in the study, which limitedly agrees with the trade-off theory. Considering the very weak negative relationship between the stock market rate of return and leverage measures, it can be concluded that leverage does not move in the same direction as the stock market return, which actually contradicts the market-timing theory.

The rest of the proposed determinants were not related to the leverage measures of listed Russian firms. These are business risk, capital expenditures as another determinant of growth opportunities, tangibility of assets, uniqueness of assets, average tax rate, the group of Energy firms, average lending rate and inflation rate.

Table 12. Summary of the findings

	Proxy	TLMV	TLBV	LLMV	LLBV	Sign of impact
Highly influential determinants	SIZE		+	+	+	+
	GROP	–	+	–		–/+
	ILEV	+	+	+	+	+
	IND1	–	–	–		–
	IND2	–	–	–		–
Moderately influential determinants	PROF	–	–			–
	NDTS		–			–
	MRTR				–	–
Irrelevant determinants	BRIS					n/a
	CAPX					n/a
	TANG					n/a
	INIQ					n/a
	TAXR					n/a
	IND3					n/a
	LENR					n/a
	INFR					n/a

Conclusions

This study employed a sample of publicly traded non-financial Russian firms over the period of 2009–2015 in order to indicate the determinants which influence firm leverage. The sample included yearly observations of 48 firms. Four leverage measures and sixteen potential capital structure determinants, including three industry dummies, were introduced into the models in order to measure the impact of the determinants on firm leverage. The study used panel data and advanced econometrics techniques in order to test the theories that explain firm capital structure decisions.

It was found that the most reliable and influential determinants are firm size, growth opportunity, and industry mean. The moderate influence determinants included profitability, non-debt tax shield and stock market return. Half of the proposed determinants that would influence the leverage of the listed Russian firms were not relevant. The Oil & Gas and Steel firms were less levered than firms from the other industries.

This study agrees with certain findings proposed by studies for both developed and developing economies [Dung, 2015; Frank, Goyal, 2009; Ivashkovskaya, Solntseva, 2007; Malinić, Denčić-Mihajlov, Ljubenović, 2013; Nunkoo, Boateng, 2010; Sheluntcova, 2014; Tamulyte, 2012].

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