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Capital Structure Puzzles in BRIC: Do Russian, Brazilian and Chinese Firms Follow Pecking Order or Trade-Off Logic of Financing?

Capital structure puzzles still remain unsolved in emerging markets including the BRIC group. Available papers discuss the determinants of capital structure as compared to developed countries at the end of 20th century or examine the determinants separately in few Eastern European and Asian samples. This paper is a part of the research projects of the Center for Corporate Finance at the Higher School of Economics (www.cfcenter.ru, www.en.cfcenter.ru). We go beyond the analysis of capital structure determinants of the firms in emerging markets and contribute to the literature by testing pecking order of financing and trade-off theories with the samples of the large-scale companies in emerging economies which are considered the most attractive for investing. We consistently apply multistage research model to the samples of 74 Russian, 84 Brazilian and 246 Chinese large-scale firms for the period of 2002-2006.

We found that the impact of the determinants on capital structure decisions differs within the national samples. When comparing Russian large-scale firms to Brazilian sample the tangibility of assets and the firm size have reverse impact over the capital structure, but the influence of the determinants of capital structure in Chinese firms is almost the same as in Brazilian sample. The results show that pecking order of financing and trade-off theories do not have the same impact over the capital structure decisions of the comparable firms in emerging markets.

Key words: capital structure, pecking order of financing, trade-off theory, emerging markets finance, financial leverage
JEL classification: G 32

The research is presented in the following way: in the first part we give an overview of the existing papers on the problem of capital structure in emerging markets, the second part focuses on the research methods we used to identify the key determinants of financing decisions of large-scale firms in Russia, Brazil and China and for testing the pecking order and trade-off theories of financing, and, finally, in the third part we introduce and interpret the results of the empirical analysis of the companies in BRIC.

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I. The Capital Structure Research Based on the Emerging Markets Data

The capital structure choice has always been one of the crucial elements of the financial architecture of the firm [Myers, 1999] which itself includes debt – to- equity proportion, ownership structure and internal corporate governance structures and, thus, becomes the key factor of the firm's value. It has been also demonstrated that the capital structure is vital for the appropriate development of the relationships between company's stakeholders [Titman et al., 1997].

There are heaps of papers devoted to the capital structure on the developed markets whereas emerging markets still lack thorough investigation. The research in the area of capital structure in the emerging markets has only recently appeared. It is mostly focused on the determinants of debt to equity choice. The researches of the latter are mostly represented by a limited number of European and Asian countries, such as Hungary [Nivorozhkin, 2002]; India [Bhaduri, 2002]; the Czech Republic, Turkey, Taiwan, Thailand, [Harvey et al., 2004]; Thailand [Wiwattanakantang, 1999]. The case is even more dramatic when speaking about Russian companies. Most of the literature on capital structure choice in Russian firms ends up with statistical descriptions [Российская корпорация, 2007]. As for the theoretical papers they are even more rare (for example, Guriev and Kvosov [Guriev, Kvasov, 2005]; Petrov [Petrov, 2005]). In 2006 Center for Corporate Finance (SU-HSE) started up a project devoted to capital structure analysis on emerging markets. First step of the research was conducted on the data of 62 large Russian companies with IAS financial reports. That stage included not only the determinants analysis but empirical testing of basic capital structure theories (trade-off and pecking order theories) as well. The results were published in "Corporate Finance" electronic journal [Ivashkovskaya, Solntseva, 2007]. The key results of the research remained robust on the enlarged sample (2001-2006 FY) and were presented on the IX International Academic Conference (SU-HSE) in April 2008 [Ivashkovskaya, Solntseva, 2008 a]. The research was also expanded with the analysis of companies that follow Russian accounting standards [Ivashkovskaya, Solntseva, 2008 b]

One could put forward an argument that this situation should not be a case of worry when speaking about emerging markets because we could simply keep in mind the results of the studies already conducted on the developed capital markets data. Indeed, a number of papers (for example [Mitton, 2006]) have already shown the convergence tendency of the developed and emerging markets. The latter are gradually reaching the formers' debt levels. This fact supports the idea of using the results of the developed markets researches when dealing with any capital structure problems on the emerging markets. This way may be certainly preferable since the quality of the financial data of these countries' companies is much higher than that of the others. However, the matter is not as obvious as that. It is necessary to be absolutely sure that the companies, operating on this or that capital market, actually follow the worldwide tendencies and that they choose their capital structure following the same logic. Only given the knowledge that a concrete capital market development does not break the general global trends, you could use the results of the previous researches.

The research *of Booth-Maksimovic* [Booth et al., 2001], based on the sample data of 10 countries with growing capital markets, along with the traditional factors of capital structure choice analyzes the influence of such macroeconomic indexes as:

- The economic growth rate
- The market capitalization of the stock market versus the GDP
- The volume of transactions on the financial market
- Financial mediation as a percentage of the GDP

As the result, the researchers found out some common features in the choice of debt to equity capital characteristic of the growing economies. *Booth et al.* [Booth et al., 2001] found out that debt ratios were correlated with mostly the same factors both in the USA market and many other developed countries. The debt ratios were lower for more profitable firms with fewer tangible assets. The authors thought that the variables controlling information differences and agency costs were strong in these countries and the impact of these factors had to be considered greater than in the developed economies. It was also revealed by the authors that institutional features matter. While the traditional determinants influence in the same way in any country, the research results presented systematic differences in the way debt ratios depend on such country factors as GDP growth rates, inflation rates, and the development of capital markets.

Most researches of this group of countries reveal the dependence of the debt- to equity decisions on the traditional factors: profitability, tangibility of assets, taxes and growth opportunities. One of the most accurately performed researches [Pandey, 2001] has shown identical influence of the factors: as the result of the model, the capital structure of the analyzed companies significantly depends on the profitability of the assets and the company size, its growth rate, risk level and the share of tangible assets. Herewith, the effect of the company investment opportunities on its capital structure is insignificant. The research has shown that the capital structure make up of the Malaysian companies corresponds to the Pecking order theory. The Hungarian companies' data research [Nivorozhkin, 2002] has shown a low level of debt and the dependence of their capital structures on the proportion of noncurrent assets, company size and the return on total assets. The dynamic model developed for India [Bhaduri, 2002] assumes that the company capital structure is influenced by such factors as its growth rate, cash flow, size, uniqueness, and industry parameters. According to the model, the costs of recapitalization on the Indian capital market are positive and are different for short and long-term borrowings.

Apart from the traditional factors some scholars consider the influence of specific factors. The analysis of the Hungarian companies has shown that companies whose main shareholder is the state or those operating in the industrial sector of the economy, have a bigger share of debt [Nivorozhkin, 2002]. The research of the Thai companies [Wiwattanakantang, 1999] has revealed that the capital structure of the listed companies is also heavily influenced by company ownership structure.

To move forward in capital structure analysis in emerging markets one has to understand the common and unique determinants in different emerging markets and the logic of financing decisions that prevail in different groups of the firms in these type of capital markets. The solutions for the above-mentioned capital structure problems will provide the basis for dynamic capital structure analysis which will help to understand whether the companies in emerging markets are adjusting their financing choices for optimal debt-to-equity decisions and for the need to increase the company's value by means of financing leverage.

2. Our Samples and Research Methods.

2.1. The Research Model

Our research model consists of three stages. The first stage implies the analysis of key capital structure determinants and their verification in all national samples. We apply different types of measurers for capital structure based on book values as well as market values to compute financial leverage ratios. We run cross-section regressions for each dependent variable measurer and year and then proceed to panel data analysis. The panels are examined by pooled, fixed effects and random effects regressions and the applicable tests to find the most powerful models at 5% level of significance and to identify key determinants for capital structure within national samples. We examine full samples and then repeat all steps for sub samples classifying companies by ownership and organizational form criteria.

At the second stage we build separate models to test *pecking order* and *trade-off* theories within each national sample for Russian, Brazilian and Chinese firms. These fundamental corporate finance concepts are examined as stand-alone competing frameworks explaining capital structure decisions in all samples. Finally, at the third stage of research we apply the simultaneous tests for both theories (pecking order versus trade-off) for each national sample to identify the comparative explanatory power of each concept. We do not combine the samples according to the results of Chow tests.

2.1.1. The Variables for Capital Structure Analysis

From the formal point of view most researches of capital structure determinants in emerging markets are represented by linear regressions that differ by the set of dependent variables and type of data[3]. The most typical model could be represented as follows:

(1) *L = f (Non Debt Tax Shield, Tangibility, Profitability, Risk, Size, Agency Costs),*

As a rule, the dependent variable is set as book value ratio (divided by total assets) or market value ratio (divided by the sum of total liabilities and market value of equity). Sometimes total debt is broken down into short term and long term parts and analyzed separately (for example, [Pandey, 2001], [Braduri, 2002]). We use different measurers for dependent variable which are summarized in the table 1.

Table 1. Dependent variable measurers for capital structure determinants analysis.

Symbol	**Ratio**	**Components**
STDR	Short term debt ratio	Interest bearing current liabilities divided by the sum of total debt and book value of equity
LTDR	Long term debt ratio	Long term interest bearing liabilities divided by the sum of total debt and book value of equity
TDR	Total debt ratio	Short term and long term interest bearing liabilities divided by the sum of total debt and book value of equity

[3] cross-section or panel data

MSTDR	Market value short term debt ratio	Interest bearing current liabilities divided by the sum of total debt and market value of equity
MLTDR	Market value long term debt ratio	Long term interest bearing liabilities divided by the sum of total debt and market value of equity
MTDR	Market value total debt ratio	Short term and long term interest bearing liabilities divided by the sum of total debt and market value of equity
STDRA	Book value short term debt ratio	Current liabilities divided by book value of assets
LTDRA	Book value long term debt ratio	Long term liabilities divided by book value of assets
TDRA	Book value total debt ratio	Total liabilities divided by total assets

We used current values of the above mentioned ratios to measure the dependent variable at the first stage of the research to analyze the key determinants of capital structure. We also used the *changes* in the above mentioned ratios comparing their current values to the previous year at the second stage of the model to test the trade-off and pecking order theories. Therefore the measurers *NSTDR, NTDR, NMTDR, NLTDRA, NTDRA* stand for the changes in the level of the ratios for the year *t* and *t-1* as it is shown in the table 2.

Table 2. Dependent variable measurers for testing trade-off and pecking order theories.

Symbols	**Components**
NSTDR	Net change in short term debt ratio for the year t compared to the year t-1.
NLTDR	Net change in long term debt ratio for the year t as compared to the year t-1.
NTDR	Net change in total debt ratio for the year t as compared to the year t-1.
NMSTDR	Net change in market value short term debt ratio for the year t as compared to the year t-1.
*NMLTDR**	Net change in market value long term debt ratio for the year t as compared to the year t-1.
*NMTDR**	Net change in market value total debt ratio for the year t as compared to the year t-1.

Symbols	Components
NSTDRA	Net change in book value short term debt ratio for the year t as compared to the year t-1.
NLTDRA	Net change in book value long term debt ratio for the year t as compared to the year t-1.
NTDRA	Net change in book value total debt ratio for the year t as compared to the year t-1.

2.1.2. The independent variables in the model

The description of independent variables needs special attention and they are summarized in the table 3. The **tangibility** factor stands for the nature of company's assets and is usually described by a number of proxies. Some scholars assume market-*to-book ratio* (*MTB*) to be good proxy for the nature of the assets because it is based on the share prices which consider market expectations about investment opportunities of the company [Wiwattanakantang, 1999]. Some authors [Braduri, 2002] apply *property-plant-equipment to total assets* ratio *(PPE/TA)*: the higher the variable the higher are the opportunities to borrow. In our study (table 3) we apply the ratio of fixed assets to total assets to measure the *tangibility* as a potential determinant for debt-to-equity choice.

Profitability is important factor for financing policies but there is no common vision of this variable. Pecking order theory followers suppose that more profitable companies should rely on their internal funds and will have less debt in their capital structure ion case of high profitability of the firm. Quite the contrary is argumentation of the trade-off theory. It assumes that a more profitable firm has more chances to acquire additional debt and, consequently, to increase its financial leverage. We use two different profitability ratios (table 3) based on assets and sales. We also consider important to apply lagged profitability variables to understand the impact of this factor for financing choices of the firms in the sample.

The trade-off theory suggests that the increase in debt financing should be based on the debt tax shields due to the deduction of interest expense when calculating profit before taxes. But there are also other tax shields like depreciation and amortization expense that should lead to lower debt ratios. To capture the impact of taxes and **tax shields** we use several variables: *Tax,* debt tax shield (*DT*) which reflects possible positive influence of debt financing and non debt tax shield (*NDT*) which may offset positive impact of financial leverage.

While adding **size** variable into regressions it is essential to keep in mind its ambiguous character. On the one hand, the larger the company the more chances it has to get a loan other things being equal. Agency theory argues for the same influence over the debt capacity of the firm, but explains it by the lower level of information asymmetry in large companies that should lead to more confidential relationship between managers and outside investors and, thus, to a higher debt ratio. However, there exists another opinion [Wiwattanakantang, 1999] demonstrating that it is more profitable for large companies with low level of information asymmetry to issue equity and reduce debt. Following research traditions in different empirical finance papers we apply two distinct measurers for company's **size** in our study**:** natural logarithm of total sales (*Ln sales*) and of total assets (*Ln assets*).

One could also find different proxies for company growth rate. These could be calculated as (1+R) where R is found from the regression of logarithm of Sales on time during 4 years [Pandey, 2001]. The alternative approach is to compute the ratio of capital expenditure to total assets [Bhaduri, 2002]. As the table 3 shows we apply the latter approach and also consider the effect of lagged growth rate variable.

To measure **information asymmetry** level the age of the company is used in some papers [Bhaduri, 2002]. In this case it is assumed that an older company has a higher level of information transparency. The alternative measurer for this type of variable is dividend payout ratio that is usually used to test signal theory according to which this variable has a negative impact over the financial leverage. In our study the variable dividend payout (*Div)* is introduced to approximate the signal for the expected cash flows of the company. We also use capital market variable in the format of market- to- book ratio (*MTB)* to capture the expectations.

The possible range of qualitative independent variables differ in the literature when it concerns emerging markets. For example, agency dummy variables are represented by numerous proxies such as: family ownership, conglomerate group affiliation, foreign ownership, size of the board of directors, managerial ownership, degree of ownership concentration. In our study we use several qualitative variables. We introduce dummy variable to control for state ownership (*Govern)* and dummy to control for the presence of foreign shareholders (*Foreign)* which may capture the degree of information asymmetry.

Table 3. Independent variables for capital structure determinants analysis.

Symbol	**Description**
NDT	Non debt tax shield (Depreciation &amortization expense/Total Assets).
Tax	Taxes accrued as a proportion of earnings before taxation
Tangibility	Fixed Assets/ Total Assets.
Prof	EBIT/ Total Assets
Lprof	Lagged Prof (*Prof* for the year t-1)
Prof2	Operating margin (Operating income to sales)
Lprof2	Lagged *Prof2* (Prof2 for the year t-1)
Lnsales	The first proxy for the size computed as natural logarithm of sales.
Lnassets	The alternative proxy for the size computed as natural logarithm of total assets
Div	Dividend payout ratio (Dividends / net income)
Growth	The proxy for growth computed as capital expenditure to total assets
Lgrowth	Lagged variable for growth computed as capital expenditure to total assets for the year t-1
MTB	Market value of equity to book value of equity
Govern	Dummy for government control equal to 1 if government has one of the major stakes in shareholder capital and to 0 otherwise
Foreign	Dummy for foreign ownership equal to 1 if the company has foreign shareholders or to 0 in the opposite case
Public	Dummy for the legal status of the company equal to 1 if the company is public and to 0 in the opposite case.

2.3. The data.

For the purpose of this study we collected the data for large-scale Russian, Brazilian and Chinese companies using several criteria to construct the samples. The test of the capital structure theories was conducted on the basis of the sample of the Russian, Brazilian and Chinese companies' data for the time period from **2001 to 2006**. The data was collected from Bloomberg [Bloomberg] database. Nevertheless, the base did not include appropriate information for every company, which resulted in the necessity of enlarging the sample using the information from the companies' official web-sites. The qualitative factors - such as the government control, public or private type of the company, existence of foreign shareholders and etc., were collected from

Bureau Van Dijk database [Van Dijk]. We consider the companies with minimum sales at $200 mln. Russian sample is based on the companies with IAS reports. As concerns Brazilian and Chinese companies it was realized that the sample based on IAS criteria would be too narrow even in Bloomberg database. Therefore we were to use audited data for the companies from Brazil and China derived from their national accounting standards. In all national samples the companies from financial sector were excluded. Thus, we built three panels of data for the period of 2001-2006:

- 74 Russian companies with IAS reports
- 84 Brazilian companies
- 246 Chinese companies

The panels derived are unbalanced even though part of the information was gathered from the official sites, still several figures were impossible to be found out. The reasons for such drops in financial data are the recent IPO process (and, thus, the absence of international format accounting for the earlier years) and companies' short history. The quantitative data is presented in the USD millions (if another measure is not mentioned). If the data for Russian companies was initially published in any other currency it was transferred into the US dollars at the official rate of exchange taken from the Central Bank of the Russian Federation [CBR]. For Brazilian and Chinese companies US dollars data was obtained from Bloomberg database.

The aim of the descriptive analysis is to introduce some basic characteristics (mean values and changes) within 2001-2006 of the firm's capital structure. For Russian companies the dynamics is being examined separately for the whole sample and for the sub samples divided by ownership structure (the existence of government and foreign investors as shareholders of a company) and by organizational form (public and private companies). The sample includes companies from 8 industries, so industry characteristics were examined as well[4].

The descriptive analysis revealed that capital structure variables based on book value measures show the identical tendency for Russian, Brazilian and Chinese companies within 2001-2006 years. It was revealed that with almost Russian and Brazil companies tend to use more long term debt while Chinese companies prefer short term debt. Nevertheless the tendencies are equal. Thus stable growth of long term and total debt ratios are typical for all samples (for *LTDR* the level grew from 8% to 12,9% in Russia, from 19,29% to 21% in Brazil and from 4,4% to 6,6% in China). The dynamics of short term debt ratios is less clear but generally the downward

[4] The descriptive analysis (as well as the following regression analysis) was obtained in Stata (version 9.2) package.

trend within 2003-2006 could be seen. Variance variables are not as much clear: *STDR*, *LTDR* and *TDR* ratios are least volatile (standard deviation varies from 0,065 to 0,139 in all samples). Debt ratios based on liabilities are a little bit more volatile (from 0,059 to 0,204). These variables do not show any changes thru the period. The minimum-maximum analysis presented the following results. While minimum is obviously equals to zero or very close to this level (1-1,5%) maximum variables differ greatly through the samples. For Russian companies maximum varies from 31% to 78% for *STDR* and from 22% to 48% for *LTDR*. The same variables for Brazilian companies are 23%-53% and 46%-65% when for Chinese firms they are equal to 45%-82% and 31%-33%. The dynamics of debt ratios based on market value of equity is more difficult to interpret as they show no concrete tendencies but expectedly have quite high standard deviation levels (from 0, 07 to 0,3).

As Russian sample included qualitative variables as well as quantitative deeper research of descriptive characteristics was available. It was found out that companies that were controlled by the government had higher long term debt levels and showed higher growth rates. For companies with foreign shareholders the reallocation effect between long term and short term debt becomes quite demonstrative. Private companies presented higher levels of all debt ratios variables.

Industry analysis (Table 6) demonstrates the leadership of transport (almost 34,6% of total debt and 66,3% of total liabilities) followed by manufacturing (26,3% and 58,4% correspondingly) and consumer goods and retail trade (25,6% and 53,8%). At the other extreme are power industry (14,7% and 33,3%) and oil and gas with their 17,4% and 36.5% total debt ratios.

2.3 Capital structure determinants analysis

The first stage of research consists of several steps to find key independent variables of capital structure. First of all, the cross-section regression (equation 2) was tested with the data of the national samples, but for Brazilian and Chinese companies we had to rely only on quantitative variables:

(2)

$$L = \alpha + \beta_1 NDT + \beta_2 \tan gibility + \beta_3 prof + \beta_4 \ln sales + \beta_5 div + \beta_6 growth + \beta_7 govern + \beta_8 public + \beta_9 foreign + \varepsilon$$

This model was checked for every dependent variable based on the book value of equity for each year and for the whole panel as well, using different measurers for dependent variable.

The panel analysis consisted of three models: pooled, fixed effect and random effect regressions. A series of tests (pooled versus fixed effect by F-test, Breusch-Pagan and Hausman tests) was used to choose the most appropriate model[5]. The analysis of market value dependent variables was following the same scheme except some alterations: the *Public* variable was dropped and the *MTB* variable was added:

(3)

$$L = \phi + \gamma_1 NDT + \gamma_2 \tan gibility + \gamma_3 prof + \gamma_4 \ln sales + \gamma_5 div + \gamma_6 growth + \gamma_7 govern + \gamma_8 MTB + \gamma_9 foreign + u$$

The analysis of Brazilian and Chinese capital structure determinants was conducted according to (3) linear regression model but excluded qualitative variables (*govern*, *public, foreign*) due to data insufficiency.

2.4. The Model for Testing the Pecking Order and Trade-off Theories

The second step of the analysis was devoted directly to the Pecking Order and Trade-off Theories tests considered as stand alone explanation of financing choices.

Researches of this type are still uncommon on the emerging markets, that is why it is necessary to look at the methodology used by the developed capital markets. Unfortunately, it makes it impossible to examine the results for the emerging markets. We decided to pay attention to key papers [Shyam-Sunder et al., 1999; Adedeji, 2002] for several reasons. Firstly, they present a clear methodology of research and, secondly, the latter work could be described as a logical development of the former. The basic model of [Adedeji, 2002] could be presented as:

(4)

$$D_{it} = a_{it} + b\ DEF_{it} + cNDTS_{it-1} + dPTBV_{it-1} + eSIZE_{it-1} + fSTRUC_{it-1} + \sum_{j=1}^{n-1} g_{i5+j}\ IND_{ij} + \sum_{k=1}^{m-1} h_{4+n+k} YEAR_k + u_{it}$$

All the variables were described earlier except *Def* variable, which stands for the internal financing deficit. It is calculated as a difference between the amount of cash generated internally and the total amount spent on tangible assets, tax, dividends, debt repayments and change in the working capital over a year.

Actually this is the stumbling block in all basic researches. While [Shyam-Sunder et al., 1999] insists on the negative value, arguing that in this case the firm tends to pay off its debt, the

[5] All of the tests were conducted on the 5% significance level

authors [Adedeji, 2002] consider that that is not necessarily so. In fact, it is more likely that the negative value of the internal deficit signifies the increased investment opportunities and the absence of necessity in additional external financing. Therefore, such situations should not influence the change in leverage and should be set equal to zero.

If the company sticks to the Pecking Order Theory, all the new debt should be explained by the internal company's financing deficit. Formally it can take the following expression [Shyam-Sunder et al., 1999]:

(5) $\Delta D_{it} = a + bDEF_{it} + e_{it}$

The hypotheses, that the free term equals 0 if the *Def* variable coefficient equals 1 at the same time, should be tested. If the company sticks to the Trade-off Theory, in this case it persistently moves towards the target level of debt. Thus, the new debt should be explained by deviation from the target level of the capital structure. This model is formally expressed in the following way:

(6) $\Delta D = f(Dt\arg et_t - Dfact_{t-1})$

Herewith, the tested hypotheses check the calculation of the coefficient if the deviation from the target level is from 0 to 1. A positive value of the coefficient confirms the conclusion that the company tends to achieve its target debt ratio. Whereas the coefficient <1 shows positive recapitalization costs. The target level is found on the basis of the coefficients that were obtained within the capital structure determinants analysis.

We began by building up a model that checks whether the process of choosing capital structure followed the *pecking order theory*. In this respect we used the following model:

(7) $NL = \alpha + \beta def + \varepsilon$,

Where:

- *NL* stands for changes in the level of debt;

- *Def* is described by the internal company's financing deficit, calculated as dividends paid plus investing cash flow with the deduction of operating cash flow.

When the *def* variable is negative it is considered as zero. We are convinced by [Adedeji, 2002] arguments.

Thus in order to find out whether the firms stick to pecking order theory the following hypotheses should be tested.

Hypothesis 1:

H0: *The companies follow the pecking order theory of capital structure. Consequently, two conditions should be fulfilled simultaneously:* $\alpha = 0, \beta = 1$. *In case the H0 is true the whole amount of new debt would be provoked by the internal companies' deficit.*

H1: (*otherwise) the companies do not follow the pecking order theory of capital structure.*

To check the appropriateness of the trade-off theory we need an additional model. Given that the trade-off theory rests on the assumption that a firm tries to reach the target debt level, a new variable responsible for the deviation from the target level is essential for testing the theory for Russian firms. In our analysis the variable was labeled *DL,* where *L* stands for different variants of dependent variables. Thus we used the model below:

(8) $NL = \alpha + \beta DL + \varepsilon$

The hypothesis tested could be described as follows:

Hypothesis 2:

H0: *Companies build their capital structure according to the trade-off theory. In the formal language it means that* $\beta > 0$ *and* $\beta < 1$. *While the positive sign illustrates the company's attempts to reach the target, the unit boundary signifies the existence of recapitalization costs.*

The target level of debt (variables *DL*) is calculated on the basis of the significant coefficients that were obtained within the determinants analysis. The determinants analysis included building linear regressions on the debt levels examined. The independent variables used are described below.

H1: (*otherwise) the companies do not follow the trade-off theory of capital structure.*

The final stage consisted in modeling joint regressions aimed to reveal the contribution of each theory in the capital structure choice of the Russian, Brazilian and Chinese companies. This idea could formally be introduced in the following way:

(9) $NL = \alpha + \beta def + \gamma DL + \varepsilon$

Checking the coefficients' significance helps to estimate the contribution of each theory.

The concluding step depicts the relevance of the theories on the sub samples. The sample is divided according to several criteria: high or low level of debt, government control or the lack of it, existence or absence of foreign shareholders, public or closed type of the company. As a result of the analysis we were able to make integrated conclusions of the most appropriate capital structure theory for Russian large companies.

3. The results.
3.1. Capital structure determinants

To summarize the results we begin with the determinants for capital structure choices in all national samples. The results for Russian sample are shown in the table 7.

Table 4. Cross-section regression's results for Russian sample for the period of 2002-2006.

2002	STDR	LTDR	TDR	SRDRA	LRDRA	TDRA
ndt	,2821***	-0,0226	-0,0830		,9873***	1,0287***
tax				0,0051		
tangibility	-,2148***	-,1555***	-,2188***	-,4528***	-,2066***	-,5027***
prof						
Lprof						
prof2		0,0174		-0,3982	-0,0430	
Lprof2	-0,0079					-0,0046
lnsales	0,0079		,0257***	-0,0018		,0270**
lnassets		,0165***			,0195***	
div	0,0171	0,0156	0,0197	-0,0229	-0,0238	-0,0213
growth	0,0873			0,7646		
Lgrowth		-,0040*	-,0062**		-0,0034	-0,0037
Govern	,0336*		0,0151	0,0353	-0,0125	0,0005
Public	-,1032 ***	-,0498**	-,0927***	0,0824	-,0951***	-,1083**
Foreign	,0356**		0,0491	0,0485	0,0186	0,0543
Const	,2706***	,1165***	,2424***	,5728***	,1872***	,6141***
N observations	29	45	45	48	46	45
R-squared	0,9495	0,3596	0,4138	0,3913	0,9471	0,8741
Prob > F	0,0000	0,0011	0,0002	0,0000	0,0000	0,0000
2003	STDR	LTDR	TDR	SRDRA	LRDRA	TDRA
ndt	,4054***	-0,1167	-,3230***		1,1636***	1,0056***
tax				-0,0489		
tangibility	-,3034***	-0,1187	-,4012***	-,5397***	-0,1980	-,7307***
prof						
Lprof				-0,2733		-0,3569
prof2	-0,1314					
Lprof2		-0,0386	0,0150		-0,0572	
lnsales		,0109*		0,00352		0,01235
lnassets	0,0044		0,0036		0,0163	
div	0,0001	-0,0002	-0,0003	-0,0001	-0,0003	-0,0007
growth	0,2005			0,8195	0,1973	,5712**
Lgrowth		,4783***	,8208***			
MTB						
Govern	0,0147	0,0527	,0656**	0,0315	,0620*	,1257**
Public	-0,0084	-0,0412	-0,0467	-0,0309	-,0528*	-,0959**
Foreign	-0,0202	0,0243	0,0197	-0,0124	0,0161	0,0207
Const	,2949***	-0,0202	,4018***	,6453***	,1259***	,8614***
N observations	56	53	54	56	56	56
R-squared	0,6379	0,1888	0,3766	0,3757	0,8186	0,7702
Prob > F	0,0000	0,0053	0,0001	0,0000	0,0000	0,0000

2004	STDR	LTDR	TDR	SRDRA	LRDRA	TDRA	MSTDR	MLTDR	MTDR
ndt	-0,6921	.4415973		-0,7022			-1,2589		-1,6965
tax			-0,0065		-,0392**	-0,0346			
tangibility	-0,0395	-.0452	-,2011**	-,2623***	0,0768	-0,1814	-0,0031	-0,1817	-,2954*
prof			-,3438**						-,6332*
Lprof								0,2340	
prof2	-,3384***			-,4914***		-,4439***	-,5544***		
Lprof2		.0602			0,0710189				
lnsales		.0116*							0,0188
lnassets	-0,0088		0,012	- 0,010	,0172**	0,009	- 0,006		
div	-0,0728	-.0945**	- 0,152	-,1323*	- 0,071	-,2260**	- 0,105	-,1844**	-,2962**
growth	0,2316	.3822**	,6582***	,6357**	0,213	,8063**		0,579	1,135
Lgrowth							- 0,033		
MTB							- 0,017	-,0256**	-,0442***
Govern	0,0022	.0251	0,022	0,012	,0633*	0,055	0,043	0,029	0,078
Public	0,0157	-.0447	- 0,050	0,007	-,0583**	- 0,054			
Foreign	-0,0122	.0187	0,027	- 0,011	0,019	0,020	0,011	- 0,032	- 0,009
Const	,1665***	-.0055	,3281***	,4629***	,1048*	,4514***	,2213***	,1972***	,6320***
N observations	68	64	68	65	71	65	48	48	48
R-squared	0,2578	0,2124	0,1634	0,425	0,2014	0,2505	0,3031	0,1791	0,3797
Prob > F	0,0000	0,0024	0,0093	0,0000	0,0046	0,0005	0,0001	0,0118	0,0003
2005	STDR	LTDR	TDR	SRDRA	LRDRA	TDRA	MSTDR	MLTDR	MTDR
ndt		0,3838					0,4671		0,7085
tax	0,0004		-0,0019	-0,0015	-0,0022	-0,0038		-0,001	
tangibility	0,0375	-0,0732		-0,1829	-0,1007	-,2751*	0,0342	-,2019**	-0,2453
prof								-,3575**	
Lprof			-,3770**		-0,2772	-,4829**			
prof2		-,0877*							
Lprof2	-0,0152			-,5240***			-,3822***		-,5628***
lnsales		0,0106		0,0065		0,0169			
lnassets	-,0204**		-0,0185		0,0136		-0,0069	-0,0025	-0,0181
div	-0,0142	-0,0006		-,0714**	-0,0271	-0,0539	-,0455**	-0,0345	-0,0729
growth	-0,3341	,8074***	,7184**	,5659**	,7739***	1,766***		,7505***	
Lgrowth							,3266**		,9542***
MTB							-,0384***	-,0386***	-,0775***
Govern	0,0097	0,0370	0,0284	0,0248	,0573*	0,0746	-0,0025	0,0388	0,0325
Public	0,0090	-0,0420	-0,0328	-0,0478	-0,0392	-0,1310			
Foreign	,0934**	0,0242	-0,0648	-0,0334	0,0499	0,0243	0,0064	0,0619	0,0601
Const	,3374***	,0470**	,2078***	,2707***	,1114***	,5185***	,1848***	,2827***	,3235***
N observations	72	70	70	62	71	71	52	52	52
R-squared	0,1451	0,2875	0,1129	0,3528	0,1974	0,2567	0,5365	0,3957	0,5145
Prob > F	0,005	0,000	0,018	0,000	0,001	0,000	0,000	0,000	0,000
2006	STDR	LTDR	TDR	SRDRA	LRDRA	TDRA	MSTDR	MLTDR	MTDR
ndt				-0,2950					,9322***
tax	-0,0078	-0,0440	-,0485**		-0,0553	-,0896**	0,0080	-0,0305	
tangibility		-,2071**	-,1852*	-,2532**	0,0980	-0,0349	-0,0323	-0,0548	-0,1368
prof									
Lprof		-,3090***	-,2949**					-,2433**	

prof2	0,0650			0,0278	0,0189	,0330*			
Lprof2							0,0549		0,0476
lnsales					-0,0052				
lnassets	-0,0343	-0,0015	-0,0032	-0,0230		-0,0147	-0,0119	-0,0051	-,0207**
div		-0,0183	-,0540*		-0,0447	-,0768*	-0,0209	-0,0113	-0,0414
growth	-0,1542						-0,2414		
Lgrowth		,7807***	1,0030***		,6378***	,8712*		,4346***	0,4704
MTB							-,0240***	-,0200**	-,0682***
Govern	0,0563	,0581**	,0949***	0,0325	,0896***	,1448***	0,0020	0,0480	0,0220
Public	-0,1123	-0,0417	-,0990***		-0,0411	-,1021*			
Foreign		-0,0212	-0,0202	0,0157	-0,0292	0,0093	0,0061	-0,0024	0,0128
Const	0,1456	,2186***	,3540***	,4100***	,1249***	,4153***	,1208***	,1303***	,4221***
N observations	67	67	56	71	69	58	65	64	65
R-squared	0,2534	0,2789	0,4547	0,0898	0,2068	0,3768	0,2056	0,3314	0,4498
Prob > F	0,089	0,000	0,000	0,011	0,001	0,000	0,000	0,000	0,000

*** 1% significance level

** 5% significance level

* 10% significance level

The results of panel regressions are shown in the tables 5-7 which is based on the most appropriate specifications. The latter were found by the tests[6] (F-test for pooled against fixed effects regressions, Breusch-Pagan test for pooled versus random effects regressions, Hausman test for fixed against random effects regressions). The omitted data in some boxes is due to the insignificant results (at 10% level by F-test). The symbol «+» captures the most effective specifications.

Table 5. The results of panel regression for Russian sample for the period of 2002-2006.

	STDR	**LTDR**	**TDR**	**SRDRA**	**LRDRA**	**TDRA**	**MSTDR**	**MLTDR**	**MTDR**
ndt	,005**		-0,0647	0,0192	1,023**	1,0636***	,7189***		,7218***
tax		-,0019***						-0,0013	
tangibility	-,1864***	0,0933	-0,1591	-,2014***	-0,0544	-,2711***	-,0854*	-0,0630	-,1842**
prof			-,1668**			-,2104**		-,1389*	-,3707***
Lprof	-0,0001								
prof2				,0339*					
Lprof2		-0,0238			0,0083		-0,0546		
lnsales		0,0310				0,0168		0,0059	
lnassets	-,0201***		0,0101	-,0398***	,0408***		-,0126**		
div	-0,0001	-0,0001	-0,0002	0,0000	-0,0005	,3034*	-0,0001	-0,0003	-0,0004
growth	-,0159**	0,1111	,1888*	0,1647	0,1531	0,3719		,1907*	
Lgrowth							,0060**		0,0045
MTB							-,0292***	-,0200***	-,0464***

[6] All the tests were carried out at 5% significance level

	STDR	LTDR	TDR	SRDRA	LRDRA	TDRA	MSTDR	MLTDR	MTDR
Govern	,0442**	-0,0566	0,0167	0,0324	-0,1144	0,0318	0,0290	0,0124	0,0395
Public	-0,0173	-,0575**	-,0375*	-0,0455	-0,0732	-,0736***			
Foreign	-0,0109	(удалена)	0,0114	0,0294	(удалена)	0,0348	-0,0169	0,0064	0,0101
Const	,3695**	-0,0605	,2481***	,6786***	-,1533**	,6297***	,2639**	,1439***	,4253***
N observations	307	307	306	312	317	311	226	227	231
N groups	73	73	73	74	74	74	69	70	69
Pooled									
Fixed		+			+				
Random	+		+	+		+	+	+	+
R-sq: within		0,1342			0,7129				
Wald chi2	59,01		12,64	64,26		487,24	488,33	28,9	266,67
Prob > chi2	0,0000		0,0055	0,0000		0,0000	0,0000	0,0000	0,0000

Table 6. The results of panel regression for Brazilian sample for the period of 2002-2006.

	STDR	LTDR	TDR	SRDRA	LRDRA	TDRA	MSTDR	MLTDR	MTDR
ndt	1.550***		-.0699	.8070***	-.2863*		1.2645***		
tax		-.0013*				.0004		.0003	.0012
tangibility	0,1025**	-.1839	-.0509	-.0537	.0167	-.0634	.3382***	-.1859	.2567***
prof					-.1723***			-.5527***	
Lprof									
prof2		.0051							
Lprof2	-.0204		-.1209***	.0262		-.0509*	.02656		-.2697
lnsales	-0,083 ***		-.0741***			-.0474***	-.1594***		
lnassets		-.0418		-.0532***	.0016			-.0320	-.0758***
div	.0005	.0007	.0006	.00072*	-.0003	.0002	.0021***	-.0339*	-.00001
growth	-.6904***	.3650	-.3122***	-.0163	.2097	-.1895***			
Lgrowth							-.0529	.7602***	.4397***
MTB	.0000	.0002***	.0002***	-.0001***	.0001***	.00003***	-.0001**	-.0731***	-.1791***
Const	0,7220***	.2852***	.9769***	.6014***	.2376***	.8017***	1.1952***	.6256***	1.0132***
N observations	376	382	314	313	414	314	313	312	312
N groups	83	84	72	72	74	72	72	72	72
Pooled									
Fixed	+	+	+	+	+	+	+	+	+
Random									
R-squared									
R-sq: within	0.4329	0.1527	0.4293	0.2025	0.1130	0.2927	0.3936	0.3987	0.6246
Wald chi2									
Prob > chi2									

Table 7. The results of panel regression for Chinese sample for the period of 2002-2006.

	STDR	LTDR	TDR	SRDRA	LRDRA	TDRA	MSTDR	MLTDR	MTDR
ndt	-1.553***	-.6061***	.1951	-.0405			.2348		.7465**
tax					-.0001	.0001		.0001	
tangibility	.0911	.0850***	.1041	.0335**	.0733***	.0068	.1068***	.0965***	.1423***
prof	-.6920***	.0378	-.5888***				-.3473***	-.0009	-.2440***
Lprof									
prof2				.0003	-.0007***	-.0004***			
Lprof2									
lnsales	.0549***			.0256***		.0270***	.0584***		
lnassets		.0389***	.3234***		.0223***			.0792***	.1904***
div	-.0026***	-.0014*	-.0014	.0009	-.0013**	-.0003	.0012	-.0012	.0009
growth	-.0998***	.0749**	-.0036	-.1089***	.0732***	-.0246	-.2142***	.0553**	-.1415***
Lgrowth									
MTB	.0369	.0004	.0882***	-.0011	-.0002	-.0051***	-.0255***	-.0007	-.0252***
Const	-.1723***	-.2671***	-2.3224***	.1303***	-.1620***	.1514***	-.1923***	-.5948***	-1.2185***
N observations	1449	1003	1458	1472	1008	1454	1453	1454	1450
N groups	246	246	246	246	246	246	246	246	246
Pooled									
Fixed		+	+	+		+	+	+	+
Random	+				+				
R-squared									
R-sq: within		0.1480	0.1849	0.1214		0.1655	0.3574	0.2621	0.5267
Wald chi2	92.44				229.60				
Prob > chi2	0.0000				0.0000				

For the Russian companies the higher the profitability, the lower is financial leverage in all specifications of the model. The growth rate is positively related to the debt ratios. The tax shields show the predictable positive relation to non debt shields and reverse relation to debt shield. It was revealed that the higher the percentage of fixed assets in total assets the lower is the debt level of Russian firms. This fact lies beyond common expectations of positive relations but was also obtained on other emerging markets according to [Nivorozhkin, 2002].

The positive effect of companies' size as natural logarithm of sales was confirmed while no interpretable results were obtained for natural logarithm of total assets proxy. Dividends have a slightly negative effect on debt ratio. It was also found out that companies controlled by the government have higher debt as well companies with foreign shareholders. Meanwhile pulic companies tend to borrow less.

Comparative analysis of capital structure determinants shows that *profitability* influences the debt- to- equity choices in the same way in all national samples. We also realize that the *tax shield* independent variable has identical impact over the financing choices of

Russian and Brazilian companies. It is not true for the *tangibility* and *size* variables: their influence on Brazilian companies is quite opposite to the results derived for Russian sample. The determinants for Chinese companies look very similar to the results for the case of Brazil. From the above-mentioned results it follows that we can not merge the samples to carry out the next stages of the research. This assumption was proved by Chow test which was applied to the specifications with the most significant dependent variables (*TDR, TDRA, MTDR*) and with the independent variables which behaved similar in all samples (*NDT, prof, div, growth, MTB*).

3. 2.Testing the trade-off and pecking order hypotheses results

The summary for this stage of research may be presented as follows:

1. The analysis could not reject either the pecking order or trade-off theory in Russia, but rejected the pecking order hypothesis for Brazil and China. So the question is actually in determining the most appropriate theory that is better nowadays in explaining capital structure in Russian, Brazilian and Chinese large scale companies.

2. As for Russian companies from the sample internal financing deficit is a significant factor of modeling capital structure but not the only one - the parameter is in charge of 8-41% of the new debt. It should be also mentioned that the results are more evident with the dependent variables based on market value of equity with higher coefficient of determination and internal financing deficit explains the major portion of new debt while the free term is insignificant (as predicted by the theory) or the significance is weak. Testing the trade-off theory did not provide any reasons to the rejection of the theory either. According to our analysis, all regressions exhibit 1% significant coefficient responsible for the deviation from the target debt level as well as the existence of recapitalization costs (the coefficients do not achieve the unit level).

3. For Brazilian sample the pecking order theory does not explain capital structure choices. The majority of the companies from this sample do not have the deficit for the period of study. And therefore the coefficients are not significant. We can not also rely on trade-off theory of financing according to the regressions.

4. The analysis of Chinese sample shows that large-scale companies most likely follow trade-off logic of financing. But as concerns the pecking order theory the explanatory power of regressions is too low.

On the basis of the results of the empirical tests we did not reject either the trade-off or pecking order theory in Russia and rejected the latter n Brazil and China. Moreover, having dividing Russian sample according several criteria we revealed the superiority each of the theories has in different cases. The results meet the conditions of the common sense. In fact, there could not be a capital market where every firm acted in the same way and followed the logic of the same capital structure concept. Secondly, the domination of this or that theory deeply depends on the time period, geographic region, local economic traditions or prevalent level of debt. This fact is confirmed by the Chow test that did not allow us to analyze Russian, Brazilian and Chinese samples together.

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