Empirical Testing of Dynamic Capital Structure Choice: Case of Russian Companies

Шахина Н.А.[10], Кокорева М.С.[11]

The article presents the results of empirically testing the predictions of the dynamic trade-off theory on the data of 56 Russian medium-sized companies. We use the data from 2004 to 2008 and show that the management behavior follows the principles of the dynamic trade-off concept. According to our analysis, the optimal interval for the company leverage becomes narrower as the profitability, size, growth opportunities and tangibility of a firm increase. Statistically significant difference between the lower and upper bounds of the interval confirms that the management adjusts the debt level targeting the optimal interval but not a specific optimal level.

Introduction

There exists a vast volume of research on capital structure; however, there is no conclusive evidence in favour of one particular theory that would explain the management decisions with regards to leverage. This area draws a lot of attention as the capital structure decision is critical for the value of a firm. Despite the apparent relevance, there is still very little research on capital structure in the emerging markets; most papers tend to focus on mature economies.

The Russian market is no exception. The existing papers about the Russian market focus on testing the basic theories, pecking order and static trade-off theories [Razmochaev, Berezinets and Volkov, 2010] and comparing the determinants of capital structure across the emerging markets [Ivashkovskaya, Solntseva, 2009]. However, the most recent papers in the developed markets examine the dynamic models which are more flexible in explaining the capital structure. Our paper contributes to the existing literature by presenting the results of testing the predictions of the dynamic trade-off theory based on a sample of 56 Russian midcap companies.

This article proceeds as follows. First, we present a review of existing literature on the dynamic version of trade-off capital structure theory. Then we proceed to describe the sample and key variables of the analysis. The third section introduces the methodological framework of the research. Finally, we present the results of the estimation and provide the interpretation. The last section concludes the article.

Dynamic trade-off theory: overview and existing research

The inquiry into the firms' capital structure started with Modigliani and Miller [Modigliani and Miller, 1958], who showed that under a given set of assumptions the capital structure does not affect the value of the firm. That paper sparked a vast amount of empirical and theoretical research and can be thought of as the foundation of modern capital structure theories. The first capital structure theory, the static trade-off theory, relaxes the assumption of the absence of corporate taxes. The result is that under the static trade-off theory a firm can achieve an optimal debt level that would balance the benefits of tax shield (tax benefits of debt, since interest is tax-deductible) and the potential costs of financial distress, which increase with higher debt levels. However, the static trade-off theory fails to explain several empirical regularities, such as negative correlation between return on assets (ROA) and leverage, as well as leverage and market-to-book ratio. Furthermore, the substantial deviations from the optimal leverage level and significantly different leverage levels for seemingly identical firms could not be reconciled with the theory. These

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[10] Выпускница МИЭФ, студентка магистратуры Cass Business School (City University London)
[11] Преподаватель кафедры экономики и финансов фирмы НИУ-ВШЭ, исследователь лаборатории корпоративных финансов

inconsistencies led to the development of an alternative theory, the pecking-order theory of capital structure.

According to the pecking order theory, in the conditions of information asymmetry, a firm prefers to use internal funding (retained earnings and other reserves); when the internal source is exhausted, the firm would use the riskless debt, then the risky forms of debt. Equity will be considered as the last resort.

However, the pecking order theory is not the only way to overcome the drawbacks of the static trade-off theory. Some of the puzzles could be resolved by introducing adjustment (recapitalization) costs, which exist due to agency problems and information asymmetry. What emerged was the dynamic trade-off theory that examines the decisions in a multi-period setting and accounts for expectations and recapitalization costs. In particular, the transaction costs associated with issuing debt and equity prevent the firm from constantly adjusting its capital structure to the optimal level. As a result, the company targets an optimal leverage interval rather than a particular level and adjusts the capital structure only when the leverage breaks out of the interval [Fischer et al., 1989].

The dynamic version of the trade-off theory can explain the negative correlation between profitability and leverage. Strebulaev argues that for a firm that rarely alters its capital structure, increased profitability reduces the leverage through higher expected profits and thus total firm value [Strebulaev, 2007]. Similarly, a decrease in profitability would increase leverage. Since most companies prefer not to recapitalize too often, there would be a negative relationship between profitability and leverage. The key insight of dynamic theory in general is that the capital structure decisions heavily depend on the expectations and the costs of adjustment.

The existing papers on the dynamic trade-off theory focus on examining the determinants of the width of the optimal interval for the capital structure [Fischer et al., 1989; Dudley, 2007], determinants of the speed of adjustment in case the debt-to-equity ratio is not within the optimal range [Dang, Kim and Shin, 2009; Leary and Roberts, 2005] and the symmetry of the firm's policy if the D/E is above or below the optimal interval boundaries [Dudley, 2007]. Furthermore, several papers empirically test the predictions of the dynamic trade-off theory [Fischer et al., 1989; Strebulaev, 2007; Dang, Kim and Shin, 2009] and examine the adjustment costs [Dang, Kim and Shin, 2009].

Some papers introduce a model for estimating the thresholds of the optimal interval. For instance, Fischer models the relation between the value of a firm and various parameters, including the boundaries of the optimal leverage level [Fischer et al., 1989]. However, the drawback of the approach is that Fischer offers an explicit value function, which requires numerous assumptions and hence is not robust. Dudley offers an approach that does not require such a function [Dudley, 2007].

There are only a handful of papers that analyse the post-adjustment leverage. Fischer suggests that the management tries to adjust the leverage to the optimal level as soon as it leaves the optimal interval, irrespective of which boundary was crossed [Fischer et al., 1989]. Mauer and Triantis, on the other hand, argue that the post-adjustment leverage level depends on which boundary was crossed [Mauer and Triantis, 1994].

Recent papers on adjustment costs agree that management decisions with regards to capital structure decisions depend on the type of costs the firm faces. Dang, Kim and Shin show that the corrections are asymmetrical hence the adjustment costs are not fixed and depend on the direction of the adjustment [Dang, Kim and Shin, 2009].

Most of the papers mentioned above use the data on developed markets, while emerging markets still lack thorough investigation. Emerging markets research generally focuses on analysing leverage determinants and testing the static trade-off and pecking order theories. Singh and Kumar examine Indian companies [Singh and Kumar, 2008], Mazur looks at Polish firms [Mazur, 2007], Ivashkovskaya and Solntseva analyse the capital structure across BRIC countries [Ivashkovskaya and Solntseva, 2008]. Russian companies are examined in Razmochaev, Berezinets and Volkov [Razmochaev, Berezinets and Volkov, 2010] and Ivanov [Ivanov, 2010]. The results of the research differ substantially, therefore a straightaway generalization is impossible. Furthermore, the inquiries

into the empirical implications of the dynamic theories are even more rare [Clark et al., 2009].

Therefore, this paper aims to contribute to the existing body of literature by empirically testing the predictions of the dynamic trade-off theory in the Russian market. We look at the determinants of the capital structure for the Russian companies and analyse them in relation to the dynamic trade-off theory. Additionally, we examine the determinants of the optimal leverage interval.

Sample description

This section describes the formation of the sample to be used for the empirical tests in this paper. The basis for the sample is the RTS2 index. We add the companies that are not included in RTS2 but have similar annual sales (USD 0.7-3bn). Financial services and real estate firms were excluded from the sample due to their specific capital structure and financing policy. We also exclude firms with no debt financing[12]. The firms in the sample have financial statements for 2004-2008 prepared under IFRS. The data is provided by Bloomberg database; any missing entries were completed on the basis of the company reports. All the financial data were converted into USD using the exchange rates provided by OANDA [www.oanda.com]. The balance sheet figures were converted using end-of-year exchange rates, while the income statements and cash flow statements were converted using yearly average exchange rates. As a result, the sample produced is a balanced panel that contains data for 56 companies for 2004 – 2008, a total of 280 observations.

Variables description

This paper uses balance sheet figures to calculate the leverage as the ratio of total debt (both long term and short term borrowings) to total assets. We do not examine the leverage based on market values as that would severely decrease the number of observations available. Moreover, midcap companies are thinly traded, which means the market values may not reliably reflect the capital structure at a given point of time.

To analyse the change in the capital structure, we use the pre- and post-issue leverage calculated as follows:

$$\text{pre issue leverage} = \frac{\text{pre issue debt}}{\text{pre issue assets}} \quad (1)$$

$$\text{post issue leverage} = \frac{\text{post issue debt}}{\text{pre issue assets} + \text{net debt issue}} \quad (2)$$

$$\text{net debt issue} = \text{post issue debt} - \text{pre issue debt} \quad (3)$$

Our dependent variable, y_i, is a discrete variable that depends on the change in leverage. It takes the value of 1 if the difference between pre- and post-issue leverage exceeds the threshold value of q, -1 if the difference is below –q. If the absolute value of the difference is lower than the threshold value, the dependent variable is 0. Following Dudley [Dudley, 2007], we use 2% as the threshold level.

Our list of dependent variables includes the determinants commonly used for testing the dynamic trade-off models. Profitability is calculated as return on assets (net income to total assets) [Dang, Kim and Shin, 2009]. According to the dynamic trade-off theory, more profitable companies closely adhere to the optimal capital structure because of higher tax shield benefits, hence optimal the interval is expected to be narrower.

The size of the company, calculated as natural logarithm of sales or total assets, is usually positively correlated with leverage, for large firms are more financially sound. On the other hand, recapitalization costs are relatively low for larger firms [Dang, Kim and Shin, 2009], therefore a narrower optimal interval should be expected.

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[12] According to Dudley, the dynamic trade-off theory cannot explain the total absence of debt [Dudley, 2007], thus it is critical to exclude these firms from the analysis. Fischer demonstrates that it is always beneficial for a firm to have a positive level of debt [Fischer et al., 1989].

The cost of financial distress is proxied by tangibility, calculated as fixed assets to total assets [Ivashkovskaya and Solntseva, 2008]. Fixed assets serve better as collateral and don't lose as much in value in conditions of financial distress [Frank and Goyal, 2007]; therefore a firm with high tangibility is expected to have higher debt level due to higher creditworthiness. At the same time, tangibility should be negatively correlated with the width of the optimal leverage interval [Fischer et al., 1989].

Another traditional variable in trade-off theory is the tax shield. The higher the effective tax rate (calculated as taxes paid to pretax earnings), the more beneficial high debt levels are, due to tax-deductibility of interest charges [Mazur, 2007]. According to the dynamic trade-off concept, the optimal interval width is smaller for a higher effective tax rate. Non-debt tax shield is used as well, calculated as depreciation expense to total assets. It is considered to be a substitute for the tax shield from debt, so the optimal debt level can be lower and the interval wider.

According to the trade-off theory, firms with high growth opportunities, calculated as capital expenditures to total assets, suffer more in cases of financial distress. Thus, firms with high growth opportunities are expected to have lower optimal leverage levels. In the dynamic framework it will imply a smaller optimal interval.

Finally, the riskiness can be defined as percentage change in operating earnings. Firms with more volatile earnings are not expected to recapitalize too often, as the costs of adjustment are higher [Mazur, 2007]. Hence the optimal interval should be wider [Fischer et al., 1989].

The model for the boundaries of the optimal capital structure

The methodology of our research is based on the model proposed by Dudley [Dudley, 2007]. The dynamic trade-off theory assumes that additional debt is issued when the leverage crosses the lower boundary of the optimal interval and debt is repurchased when the upper boundary is crossed. As a result, a new debt issue is expected if in the previous period z_i was lower than $\underline{L_i}$ and a repurchase is expected if $z_i > \overline{L_i}$.

$$\frac{z}{1-z} = \frac{Debt}{Equity} \quad (4)$$

$$z = \frac{Debt}{Assets} \quad (5)$$

$$y_i = \begin{cases} 0, & \underline{L_i} \leq z_i \leq \overline{L_i} \\ -1, & z_i > \overline{L_i} \\ 1, & z_i < \underline{L_i} \end{cases} \quad (6)$$

Then the functions f_1 and f_2 are introduced as

$$f_1(x_{1i}, \beta_0, \epsilon_i) = \frac{e^{x_{1i}\beta_0 - \epsilon_i}}{1 + e^{x_{1i}\beta_0 + \epsilon_i}} \quad (7)$$

$$f_2(x_{1i}, x_{2i}, \beta_0, \gamma_0, \epsilon_i, \eta_i) = \min\left(\frac{e^{x_{1i}\beta_0 + \epsilon_i}}{1 + e^{x_{1i}\beta_0 + \epsilon_i}}, \frac{e^{x_{1i}\gamma_0 + \eta_i}}{1 + e^{x_{1i}\gamma_0 + \eta_i}}\right) \quad (8)$$

The upper ($\overline{L_i}$) and the lower ($\underline{L_i}$) bounds are the functions of the following variables:

$$\overline{L_i} = f_1(x_{1i}, \beta_0, \epsilon_i), \quad \underline{L_i} = f_2(x_{1i}, x_{2i}, \beta_0, \gamma_0, \epsilon_i, \eta_i) \quad (9)$$

where the vector (ϵ_i, η_i) has a bivariate normal distribution. Moreover, ϵ_i and η_i are assumed independent to simplify the calculations, although the existence of correlation is more realistic. Therefore:

$$\text{Var}(\epsilon_i) = \sigma^2_\epsilon \text{ и } \text{Var}(\eta_i) = \sigma^2_\eta \quad (10)$$

Nevertheless, the correlation problem is not that critical as f_2 is expressed as a minimum of two exponential functions, which allows to take into account the correlation between the boundaries.

By construction, the values of $\underline{L}_i$ and $\overline{L}_i$ lie between zero and one, and the lower bound is necessarily below the upper one. This is consistent with the possible range for leverage values (as expressed by total debt to total assets).

Thus the model allows the estimation of the boundaries that are unique for each firm and are dependent on the firm characteristics. To analyze the bounds, it is necessary to introduce the probability functions for each possible level of y_i:

$$P(y_i = 1 | x_{1i}, x_{2i}, z_i) \quad (11)$$
$$P(y_i = 0 | x_{1i}, x_{2i}, z_i) \quad (12)$$
$$P(y_i = -1 | x_{1i}, x_{2i}, z_i) \quad (13)$$

Expectation of y is then determined as:

$$E(y_i) = 1 \cdot P(y_i = 1 | x_{1i}, x_{2i}, z_i) + (-1) \cdot P(y_i = -1 | x_{1i}, x_{2i}, z_i) + 0 \cdot P(y_i = 0 | x_{1i}, x_{2i}, z_i) \quad (14)$$

$$E(y_i) = P(y_i = 1 | x_{1i}, x_{2i}, z_i) - P(y_i = -1 | x_{1i}, x_{2i}, z_i) \quad (15)$$

$$\overline{S}_i = x_{1i}\beta_0 + \epsilon_i \quad (16)$$
$$S_i \equiv x_{2i}\gamma_0 + \eta_i \quad (17)$$

$$P(y_i = -1 | x_{1i}, x_{2i}, z_i) = P\left(z_i > \frac{e^{\overline{S}_i}}{1 + e^{\overline{S}_i}} \right) = P\left(1 - z_i < \frac{e^{\overline{S}_i}}{1 + e^{\overline{S}_i}} \right) = P\left(\overline{S}_i < \log\left(\frac{z_i}{1 - z_i} \right) \right)$$

$$= \Phi\left(\frac{\log\left(\frac{z_i}{1 - z_i} \right) - x_{1i}\beta_0}{\sigma_\varepsilon} \right) \quad (18)$$

$$P(y_i = 1 | x_{1i}, x_{2i}, z_i) = P\left(z_i < \min\left[\frac{e^{\overline{S}_i}}{1 + e^{\overline{S}_i}}, \frac{e^{S_i}}{1 + e^{S_i}} \right] \right) = P\left(z_i < \frac{e^{\overline{S}_i}}{1 + e^{\overline{S}_i}} \right) P\left(z_i < \frac{e^{S_i}}{1 + e^{S_i}} \right) =$$

$$\left[1 - \Phi\left(\frac{\log\left(\frac{z_i}{1 - z_i} \right) - x_{1i}\beta_0}{\sigma_\varepsilon} \right) \right] \left[1 - \Phi\left(\frac{\log\left(\frac{z_i}{1 - z_i} \right) - x_{2i}\gamma_0}{\sigma_\eta} \right) \right] \quad (19)$$

$$P(y_i = 0 | x_{1i}, x_{2i}, z_i) = 1 - P(y_i = 1 | x_{1i}, x_{2i}, z_i) - P(y_i = -1 | x_{1i}, x_{2i}, z_i) \quad (20)$$

We use Non Linear Least Squares (NNLS) to estimate the above functions. Maximum likelihood method is also acceptable but is more complicated and gets minus infinity value in case of null probability. To use NNLS method the following function is used:

$$\omega = argmin \frac{1}{n} \sum_{i=1}^{n} (y_i - E_\omega y_i) \quad (21)$$

where ω is a set of parameters

We use robust standard errors to address the heteroscedasticity problem.

In order to determine the impact of a particular variable on the probability of getting a given value of y, we take the derivative of the probability function with respect to that variable. To arrive at a numeric value of the derivative we use the mean values of the variables.

Results of leverage optimal interval estimation

At the first step we tested a model 1 that included all the described above independent variables (ROA, tangibility, growth, lnsales, non debt tax shield, tax shield, volatility (risk)). To avoid the possible multicollinearity problem the correlation matrix was built (table 9 of the appendix). Although the correlation between variables is not high, almost all variables of these models are insignificant at any reasonable significance level. We believe that the problem is with non debt tax shield and tangibility variables. Both of the variables are widely used in capital structure analysis and serve as proxies for different leverage determinants. Nevertheless the more

tangible assets a firm has the more non debt tax shield should be. Thus, we decided to drop one of the variables from the analysis. We proceeded with different specifications the results for which could be observed in table 1 and tables 5-7 of the appendix.

Table 1

Estimation of optimal frontiers by model 2

frontier	y2	Coef.	Std. Err.	t	P>|t|	Expected sign
Lower	constant	3.485199	1.890	1.844	0.065	
	ROA	0.0749005	0.036	2.104	0.035	+
	Tang	-3.806326	1.017	-3.741	0.000	+
	lnsales	-0.4528367	0.244	-1.856	0.063	+
	growth	3.421201	2.586	1.323	0.186	+
Upper	constant	20.4687	6.993	2.927	0.003	
	ROA	-0.9684824	0.315	3.077	0.002	-
	Tang	-16.6027	3.765	-4.409	0.000	-
	lnsales	-2.523278	0.791	-3.192	0.001	-
	growth	-43.9873	14.113	-3.117	0.002	-

Although the results of various models testing are quite robust we chose model 2 as a final one that provides us with the significant results that are robust and could be interpreted. We used the results of this model for the derivatives calculation.

Table 2

Derivatives estimation for model 2

dP(y=-1)/dx		dP(y=0)/dx		Expected sign	dP(y=1)/dx	
ROA	-0.256	ROA	-0.151	-	ROA	0.105
Tang	4.385	Tang	-2.418	-	Tang	-1.968
lnsales	0.666	lnsales	-0.376	-	lnsales	-0.290
growth	11.619	growth	-7.347	-	growth	-4.272

Table 2 presents the results of probability function derivatives with respect to the determinants. We have found that profitability (ROA) is significant and the optimal interval is becoming less with the increase of profitability. The negative value of derivative P(y=0) with respect to ROA is inconsistent with the dynamic trade-off theory predictions.

Both tangibility coefficients are less than zero. This fact complicates the interpretation of possible tangibility influence so the derivatives calculation is necessary. The derivative P(y=0) with respect to tangibility is negative which means that tangibility growth leads to the narrowing of leverage optimal interval. This result is also consistent with the dynamic concept that predicts positive relationship between costs of financial distress and the width of optimal interval, or, formally $dP(y=0)/dTangibility < 0$.

Negative lnsales coefficient for the upper limit agrees with the theory as the size effect makes it easier to recapitalize. The P(y=0) derivative is less than zero which is also predictable [Fisher et al., 1989].

The signs of the coefficients for the upper and lower thresholds (note, however, that only the upper is significant) as well as the derivative sign coincide with the expectations. The costs of potential financial distress are higher for firms with good growth opportunities. Therefore the latter

will try not to deviate far from the optimal level and decrease leverage when it reaches the upper threshold.

The next step is to check whether the coefficients obtained in model 2 with NNLS method are reasonable and ensure that the upper boundary is greater than the lower one. To test this we calculated probabilities $P(y=1)$, $P(y=-1)$, $P(y=0)$ for each observation (formulas 18, 19, 20).

Then all the observations were divided into three groups according to the event with the highest probability ($P(y=1)$, $P(y=-1)$ or $P(y=0)$). For groups with $y=-1$ and $y=1$ average pre-adjustment leverage was calculated. The results are presented in table 3.

Table 3

Average values for upper and lower thresholds for model 2 specification

Upper	Lower
0.329	0.269

We followed the Dudley methodology [Dudley,2007] and used Wilcoxon rank-sum test to test the significance of the observed difference in boundaries. The null hypothesis is that the boundaries coincide, while the alternative states that they are statistically different. The results of the test (presented in table 4) conducted in Stata show that Z-statistics equals 8.55 and its p-value is 0.00. Consequently the null hypotheses should be rejected at any reasonable level of significance. Thus, the thresholds of the optimal interval exist and do not coincide. Moreover, as the average debt ratios for $y=-1$ group is higher than for $y=1$ group, we could summarize that the model correctly predicts whether the observed leverage is below or above the optimal interval bounds.

Table 4

Test for the difference between the thresholds

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

categ	obs	rank sum	expected
-1	131	23332	17816
1	140	13524	19040
combined	271	36856	36856

unadjusted variance	415706.67
adjustment for ties	0
adjusted variance	415706.67

Ho: leverage(categ==-1) = leverage(categ==1)

$z = 8.555$

$\text{Prob} > |z| = 0.0000$

Summary

Dynamic trade-off theory predicts that managers take into account not only benefits and costs of the optimal debt-to-equity ratio while considering the firm's financing policy, but also recapitalization costs. Therefore, an optimal leverage interval should exist within which adjustment costs are higher than the benefits of optimal capital structure. Thus management should take recapitalization actions only in cases when the leverage of the firm crosses the thresholds of the optimal interval.

Our research conducted on a sample of Russian companies revealed that actions of Russian managers are compatible with the predictions of dynamic trade-off theory. The optimal leverage interval is decreasing with the growth of profitability, company size, tangibility and growth

opportunities. The difference in upper and lower thresholds was found to be significant which means that managers target an optimal leverage interval but not a certain level.

The capital structure of Russian companies, in particular the speed of adjustment and the post-adjustment leverage, requires further investigation. Moreover, other issues such as agency costs and behavioral factors provide ample opportunities for research.

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Appendix

Table 5

Frontiers estimation results (Model 1 specification)

frontier	y2	Coef.	Std. Err.	t	P>|t|
Lower	constant	10.11837	3.932002	2.57	0.011
	ROA	0.1033837	0.0384002	2.69	0.008
	Tang	-0.9066789	1.444553	-0.63	0.531
	lnsales	-1.109575	0.4723951	-2.35	0.02
	growth	8.05594	3.33543	2.42	0.017
	ndts	-96.58357	24.2668	-3.98	0
Upper	constant	47.10571	200.0976	0.24	0.814
	ROA	0.4234911	1.933149	0.22	0.827
	Tang	-2.809022	56.83534	-0.05	0.961
	lnsales	-3.665187	13.13469	-0.28	0.78
	growth	-34.74036	171.3164	-0.2	0.84
	ndts	-115.1197	389.5723	-0.3	0.768

Table 6

Frontiers estimation results (Model 3 specification)

frontier	y2	Coef.	Std. Err.	t	P>|t|	expected
Lower	constant	-1.23577	1.944	-0.636	1.475	
	ROA	0.092384	0.037	2.498	0.012	+
	Tang	-4.31481	0.937	-4.605	0.000	+
	lnassets	0.206347	0.263	0.786	1.568	+
	growth	4.263944	2.577	1.654	0.098	+
Upper	constant	20.31917	13.754	1.477	0.140	
	ROA	0.131689	0.188	0.700	0.484	-
	Tang	-0.46708	7.747	-0.060	0.952	-
	lnassets	-2.12754	1.554	-1.369	0.171	-
	growth	-7.45395	8.537	-0.873	0.383	-

Table 7

Frontiers estimation results (Model 4 specification)

frontier	y2	Coef.	Std.	t	P>|t|	expected
Lower	constant	1.85285	1.790363	1.035	0.301	
	ROA	0.078863	0.03771	2.091	0.036	+
	Tang	-2.69859	0.951565	-2.836	0.005	+
	lnassets	-0.26579	0.236582	-1.123	0.261	+
Upper	constant	25.95482	15.17006	1.711	0.087	
	ROA	1.332488	0.896238	1.487	0.137	-
	Tang	-59.2942	21.14243	-2.805	0.005	-
	lnassets	3.392038	2.285417	1.484	0.138	-

Table 8

Variables descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lnsales	270	6.741036	0.8507376	4.087286	8.955318
roa	270	6.235572	9.424943	-28.3345	43.0314
tangibility	270	0.5543053	0.2141734	0.1425515	0.981295
growth	270	0.0915354	0.1281997	-0.896036	0.584989
bookleverage	270	0.2731628	0.1675931	0.0012641	0.7575523
debt/equity	270	0.4682498	0.4283035	0.0012657	3.1246

Table 9

Variable correlation matrix

	lnassets	lnsales	ROA	tangibility	growth	risk	tax shield	NDTS
lnassets	1							
lnsales	0.737	1						
ROA	-0.2161	-0.1546	1					
tangibility	0.2931	0.0664	-0.0121	1				
growth	0.1985	0.1632	-0.1935	0.1764	1			
risk	-0.0736	-0.0497	-0.1951	0.0762	-0.0231	1		
tax shield	-0.0619	-0.0073	0.012	-0.0095	-0.0581	0.1558	1	
NDTS	0.0799	0.102	-0.1963	0.4237	0.1952	0.0411	0.0154	1