International Review of Business Research Papers
Vol. 7. No. 2. March 2011. Pp. 21-36

The Determinants of Capital Structure for Selected Bangladeshi Listed Companies

Mohammad Abu Sayeed*

An OLS regression method has been applied to find out determinants of capital structures of Bangladeshi listed companies. The determinants are selected based on two prominent theories of capital structure, static trade-off theory and pecking order theory. Data from 46 companies listed in Dhaka Stock Exchange (DSE) for seven years (1999 – 2005) has been collected from annual reports. Total number of observations was 322. OLS regression for panel data with cross section random effects was run with two equations. Total debt to market value of the company was used as the leverage ratio in one equation and long term debt to market value was used in another equation. The results show that agency costs are negatively affecting the total debt ratios of Bangladeshi companies. Tax rate is having positive impact only for long term debt and non debt tax shields such as depreciations are negatively impacting on total debt ratio. Bankruptcy costs and profitability are irrelevant in determining leverage ratios, while firm size has positive impact in determining both total and long term debt ratios. Collateral value of assets positively influence only total debt ratio whereas number of years in operation does not have very significant impacts on the capital structure determination. Another variable - industry characteristic, has been found to be a significant determinant of debt ratios.

GEL Code: G32
Keywords: Capital structure, debt ratio, agency cost, bankruptcy cost, tax shield.

1. Introduction

Finding an appropriate capital structure is a matter of concern in the area of corporate finance. Wisely taken capital structure decisions can lead to increased profitability and/or decrease the risk of a particular firm and thus increase the firm value. By capital structure we mean the mix of different types of funding sources that constitute the total assets of the company. The higher the proportion of debt in the capital structure the company is said to have a higher financial leverages. Capital structure decisions enable firms to allocate risk and the control power among different groups of stakeholders. That is why it has become one of the most researched areas in the field of corporate finance. A considerable portion of these researches have been employed to explore the factors that determine the extent of leverage in the capital structure. But this author could not find any such research on the firms of Bangladesh which has a unique set of socio economic and political culture. Thus a gap exists in the literature of capital structure and the current study has been conducted with an intention to fill up this gap.

*Mohammad Abu Sayeed, Assistant Professor, Institute of Business Administration
jahangirnagar University

Previous researches on capitals structures have aimed to find out 1) the influences of capital structure on firm value, 2) firm choices of capital structures and 3) the determinants of capital structure choices. The current study falls in the third category of research. Panel data OLS and Tobit regressions have been run on yearly data ranging from 1999 to 2005 collected from 46 companies listed in Dhaka Stock Exchange (DSE). The objective is to investigate the determinants of capital structure of those companies.
The rest of the paper has been organized into six sections. The next two sections review the research articles that study the theory of capital structure and capital structure determinants. Relevant hypotheses have been developed in these sections. Section four presents data and sources of data collection. The methodology applied in this study is described in section five. Results are discussed in section six and section seven draws the conclusion.

2. Theories of Capital Structure

The study of capital structure is pioneered by the widely regarded paper of Modigliani and Miller (1958). This study has sparked debate in both the academic and real business arena about the relevance of capital structure choices on firm value. However, a general consensus has been established since then, that the capital structure has an impact on the firm value (Akhtar, 2005).

The theory of capital structure can be classified into two distinctive schools of thought. The first theory is known as 'static trade-off' theory which was first proposed by Modigliani and Miller (1963). This theory suggests that firms decide about capital structure through a trade-off between benefits and costs of having debt in the capital structure. The principal benefit of debt is that the resulting interest is tax deductable and thus reduce tax burden of the firm. One major cost of having debt for a firm is the bankruptcy cost (Mazur, 2007) which arises from increasing the probability of the firm to become bankrupt in case of its failure to repay the debts. Another cost is the agency cost (Jensen and Meckling , 1976; Myers, 1977), which are the costs associated with negating the conflict of interest between creditors and shareholders. Examples of such costs are the increased interest cost charged by the creditors because of their requirement of higher monitoring and implementing control devices. To reach the equilibrium point, the firm must employ debt in a way that the benefits of debts become equal to costs of debts. This equilibrium point indicates the optimal capital structure for a firm.

Another important theory of capital structure is the pecking order theory. This theory states that corporate managers choose capital according to the following preference: internal finance, debt, equity (Myers, 1984; Myers and Majluf, 1984). The theory assumes that mangers do not seek any optimal level of leverage; rather debt is collected only when internal funds are not adequate to meet funding requirements. Equity is the last resort for the firms in an environment where information asymmetry exists between company insiders (managers) and outsiders (shareholders). Managers having superior knowledge about the actual value of the stock avoid issuing equity when they feel that the stock is undervalued in the market (Myers and Majluf, 1984).

Based on these theories different studies have developed a set of determinants for debt ratio of the firm and empirically tested those determinants. Some of the recent such studies are Akhtar (2005), Mazur (2007), Mira (2005), Kim, Heshmati and Aoun (2006), Eldomiaty (2007, Fattouh, Harris and Scaramozzino (2008), Antoniou, Guney and Paudyal (2008) etc.

3. Determinants of Capital Structure

Previous studies have used different forms of leverage ratio to represent the capital structure of a firm. The differences exist both in selecting the numerator as well as the denominator of the leverage ratio. Some researchers have used only long term debt (Chkir and Cosset, 2001) while others opted for total debt as the numerator (Bevan and Danbolt, 2002). As the denominator, some researchers have used market value of firm (Chkir and Cosset, 2001) while book value of the firm was used by others (Graham and Harvey, 2001, Mazur, 2007). This study has used following two measures as a proxy of capital structure variable. Here leverage is defined as

$$\text{LTDM} = \frac{Long\ term\ debt}{Long\ term\ debt + market\ value\ of\ equity}$$

$$\text{TDM} = \frac{Total\ debt}{Total\ debt + market\ value\ of\ equity}$$

As discussed in the previous section debt is associated with agency cost. Three proxy variables have been widely used to express agency cost (Akhtar, 2005). Titman and Wessels (1988) have proposed the following ratio as agency cost which is treated as TW in the literature.

$$\text{TW} = \frac{Cash\ and\ marketable\ securities}{3\ years\ average\ asset}$$

Another variable proposed by Lehn and Poulsen (1989) (cited by Akhtar, 2005) represents the free cash flow of the firm. The variable is as follows;

$$\text{LP} = \frac{EBIT + dep + Amo - Tax - Div}{10{,}000}$$

Here,

EBIT = earnings before interest, tax and abnormal profit
Dep = depreciation expenses
Amo = amortization reported separately from depreciation.
Tax = total tax paid
Div = total dividend paid

The third variable for agency cost proposed by Jensen, Solberg and Zorn (1992) and Mehran (1992) (cited by Akhtar, 2005) is as follows:

JM = $\frac{\Delta Total\ assts}{Total\ assets}$ where $\Delta Total\ assts$ = *total asset*$_t$ – *total asset*$_{t-1}$

The firms tend to reduce leverage if substantial agency cost exists in the firm, as a result the relationship between these two variables will be inverse. Hence it is expected that TW, LP and JM will have negative impact on firm's leverage. Thus our first hypothesis is:

Hypothesis 1: *Agency cost variables - TW, LP and JM should have negative impact on leverage.*

Bankruptcy cost is another cost of debts as argued by the static trade-off theory. The firm will have incentive to reduce the debt level when bankruptcy cost is high. High volatility in earnings of a firm indicates the presence of bankruptcy cost. Hence, the study has adopted the proxy variable as the standard deviation of first difference in earnings, which Akhtar (2005) has used in her study.

$$BC = \frac{Standard\ deviation\ of\ first\ difference\ in\ EBIT}{Total\ asset}$$

The relationship between BC and leverage should be negative as firms with high BC will reduce debt in order to minimize bankruptcy cost. Thus our second hypothesis will be

Hypothesis 2: *Bankruptcy cost would have negative relationship with firm leverage.*

According to the static trade-off theory the benefit of debt is the tax deductibility of the corresponding interest payments. As a result firms will choose high debt ratio if it pays high tax rate to reduce the tax load. Effective tax rate is defined in literature as

$$TAX = \frac{Tax\ paid}{Profit\ before\ tax}$$

Hypothesis 3: *Effective tax rate should positively affect the leverage.*

According to De Angelo and Masulis (1980) non-debt tax shields can serve as an alternative to debt tax shield. Non debt tax shields are created by depreciation expenses which are tax deductible but do not require any cash outlay. As existence of high non-debt tax shields has already reduced tax burden, a firm will require less amount of debt to reduce its total tax liability. Thus the relationship should be negative between leverage and non-debt tax shield.

$$NDTS = \frac{Total\ annual\ depreciation\ expense}{Total\ assets}$$

Hypothesis 4: *Higher non-debt tax shields allow firms to maintain lower leverages.*

The pecking order theory of capital structure asserts that firms which are more profitable would prefer to finance from internal sources than the external source. Thus more

profitable firms will hold less debt level than low profitable firms. Profitability was measured by net profit to sales ratio by Akhtar (2005) and Mazur (2007) whereas Mira (2005) used EBIT to total asset ratio. This study has taken the ratio of net profit to sales as the profitability measure because it is the net profit figure that influenced more in managerial decision making, rather than EBIT. Thus

$$\text{PROF} = \frac{Net\ income}{Total\ sales}$$

A profitable firm should have more internal fund at its disposal to meet its funding needs. According to pecking order theory these firms are less likely to issue debt and maintain low leverage ratio. Accordingly our next hypothesis is

Hypothesis 5: *Profitability is negatively related with debt ratio.*

Firm size is another variable that has been widely used in capital structure studies such as Mira (2005) and Akhtar (2005). Larger firms can reduce bankruptcy risk by diversifying its businesses. At lower bankruptcy cost these firms can employ greater proportion of debts to achieve higher interest tax shield (Warner, 1975). Under this assumption we can predict a positive relationship between firm size and debt ratio. Natural logarithm of total assets has been widely used as the proxy of firm size.

Size = ln (total assets)

Our hypothesis in this regard is:

Hypothesis 6: *The bigger the firm the lower would be the leverage ratio.*

Rajan and Zingales (1995) showed that tangibility provides a collateral value to the assets and thus becomes a determinant of debt ratio. The reason is that, these tangible assets can be used as collateral to enable firms to borrow at favorable terms. Thus there should be a positive relationship between these two variables. Different authors such as Akhtar (2005) and Mazur (2007) used the following variable as the collateral values of assets:

$$\text{CVA} = \frac{Fixed\ assets}{Total\ assets}$$

Hypothesis 7: *The fixed asset ratio should positively affect debt ratio.*

A relatively less used variable is number of years in operation for the firm. This study has adopted this variable with the argument that firms with many years in business should be able to generate more internal fund. According to the pecking order theory these firms should require less debt financing. In this context, we can assume that age of the firm is negatively related with debt ratio.

AGE = ln (number years in operation)

Hypothesis 8: *number of years in operation would negatively impact leverage.*

Firm debt ratio can also vary by industry (Myers, 1977). This study has considered industry as one of the explanatory variables and used dummy variables 1 and 0 to represent the industries. Firms from five industries are included in this study. Four dummy variables are created keeping textile industry as the base industry. The variables for other industries are: Cement = CEM, Pharmaceutical and chemicals =PHAM, fuel and Energy = FUEL and Tannery = TAN. Here the Hypothesis is that

Hypothesis 9 = *Leverage ratio differs significantly for industry differences.*

4. Data

Data were collected from Bangladeshi companies which are listed in the Dhaka Stock Exchange (DSE), the major stock bourse of the country. Only listed companies were selected because accounting and market price information are not published and available for other forms of organizations in Bangladesh. Book values of the variables are collected from audited financial statements published in the annual reports of selected companies. All the annual reports are collected from the DSE Library. The study had to depend on availability of annual reports in DSE Library in selecting number of companies and also the time period to be included in the study. DSE could provide annual reports from 1997 to 2005 of those listed companies. One of the explanatory variables, TW required average of 3 years' total assets; as a result data from only 1999 could be used in this study. Therefore, the study could include 7 years' data ranging from 1999 to 2005 for each company selected.

Industry is one of the independent variables of this study. The study has followed the same classification as used by DSE to avoid any controversy. The industry classified by DSE are as follows: Bank, Non-Banking Financial Institutions (NBFI), Investment companies, Insurance, Food, Fuel and Energy, Textile, Pharmaceuticals and Chemicals, Paper and others, Services, Ceramics, Cement, Information Technology, Telecom and Miscellaneous. Total number of listed company at present is 450. Nature of business of Banks, NBFIs, investment companies and insurance companies are different from firms of other industries. These industries are also regulated by separate regulatory bodies and laws. Following previous studies of capital structure (Akhtar, 2005, Mazur, 2007) these industries are excluded from this research. Companies included in Engineering, Food, Services, and Miscellaneous industries are found to have wide varieties of product offerings that made them unrealistic to be included in a single industry. As a result the study opted to exclude these industries as well. Companies included in Telecom and Information Technology could not be included due to paucity of available annual reports in DSE Library to cover the time period of 1997-2005. Within the selected industries only those companies were listed for which annual reports are available from 1997/1998 to 2005. The selected industries and number of companies from each industry are shown in Table one.

Table 1: Sample selection

Industry-wise number of companies selected for the study. All companies are listed in Dhaka Stock Exchange. The period covered is 1999-2005. Total number of observation is 322

Industry	**Number of company selected**	**No of years covered**	**No of observations**
Textile	23	7	151
Pharmaceutical and chemicals	8	7	56
Tannery	7	7	49
Cement	5	7	35
Fuel and energy	3	7	21
Total	**46**	**7**	**322**

The descriptive statistics of the variables are listed in Table two.

Table 2: Descriptive statistics of the variables

Variables	Mean	Median	Maximum	Minimum	Std. Dev.
TDM	0.6108	0.6988	0.9913	-0.0727	0.3053
LTDM	0.3650	0.3013	0.9908	0.0000	0.3352
TW	0.0426	0.0082	0.9117	-0.0016	0.1007
LP	4548.28	1669.21	56076.48	-22119.06	9979.93
JM	-0.0168	0.0419	0.9213	-8.9881	0.7077
NDTS	0.0357	0.0299	0.2093	0.0000	0.0286
BC	0.0285	0.0131	0.4702	0.0000	0.0479
PROF	-1.4011	0.0202	1.4801	-381.7011	21.3773
SIZE	20.1421	20.2277	23.5605	16.4886	1.3315
CVA	0.5425	0.4794	8.9577	0.0122	0.6953
L_AGE	2.7368	2.8332	3.6109	0.6931	0.5479

Table two shows that, the selected Bangladeshi companies are using 61.08% debt on the average in their capital structure when market value of assets is concerned. Long term debt is employed as 36.50% of the market value of the companies on average. Average profitability of these companies is negative. To examine multi-collinearity among the variables, a correlation matrix has been obtained and shown in Table three.

Table 3: Collinearity matrix

Variables	TDA	TDM	TW	LP	JM	TAX	NDTS	BC	PROF	SIZE	CVA	AGE
TDA	1.00	0.21	-0.04	-0.14	-0.82	-0.03	0.14	0.11	-0.11	-0.24	0.51	0.09
TDM	0.21	1.00	-0.33	-0.38	0.04	-0.10	-0.04	-0.19	-0.08	-0.05	-0.02	-0.16
TW	-0.04	-0.33	1.00	0.04	0.02	0.09	-0.17	-0.06	0.03	0.04	-0.03	0.24
LP	-0.14	-0.38	0.04	1.00	0.05	0.14	0.11	-0.06	0.06	0.52	0.05	0.13
JM	-0.82	0.04	0.02	0.05	1.00	0.01	-0.21	-0.10	0.00	0.24	-0.56	-0.03
TAX	-0.03	-0.10	0.09	0.14	0.01	1.00	-0.05	-0.01	0.01	0.02	-0.03	0.09
NDTS	0.14	-0.04	-0.17	0.11	-0.21	-0.05	1.00	0.09	0.05	-0.24	0.43	-0.30
BC	0.11	-0.19	-0.06	-0.06	-0.10	-0.01	0.09	1.00	-0.02	-0.11	0.09	-0.17
PROF2	-0.11	-0.08	0.03	0.06	0.00	0.01	0.05	-0.02	1.00	0.04	-0.04	-0.04
SIZE	-0.24	-0.05	0.04	0.52	0.24	0.02	-0.24	-0.11	0.04	1.00	-0.20	0.10
CVA	0.51	-0.02	-0.03	0.05	-0.56	-0.03	0.43	0.09	-0.04	-0.20	1.00	-0.13
L_AGE	0.09	-0.16	0.24	0.13	-0.03	0.09	-0.30	-0.17	-0.04	0.10	-0.13	1.00

Table 3 shows that multicollinearity should not be a concern for this data set.

5. Method

Multiple Ordinary Least Square (OLS) Regression was run in order to measure the impact of explanatory variables on leverage ratio of the selected companies. The nature of data used in this study enables us to use panel data methodology which is deemed to have advantages over cross section and time series data methodologies. Panel data can control heterogeneity among the cross sections and also can reduce multi-collinearity problem of the explanatory variables (Mira, 2005). Cross sectional random effect model has been used since the random effect model provides more efficient estimator of p-values. Hausman tests were run to verify suitability of the random effect model for the data set. Unfortunately the test results found adequate evidence against the null hypothesis that there is no misspecification in the model. We could not use the fixed effect model as well since we have used dummy variables in our model. As a result we run Tobit regressions to verify the results obtained by running OLS random effect model. Rajan and Zingales (1995) and Akhtar (2005) used Tobit regressions in their capital structure study as they observe that the dependent variable - debt ratio is a truncated variable for which Tobit regression is appropriate.

Our Model is as follows:

$$\text{Leverage} = \alpha + \beta_1 TW + \beta 2LP + \beta_3 JM + \beta_4 BC + \beta_5 TAX + \beta_6 NDTS + \beta_7 PROF + \beta_8 SIZE + \beta_9 CVA + \beta_{10} AGE + \beta_{11} Dummy_1 + \beta_{12} Dummy_2 + \beta_{13} Dummy_3 + \beta_{14} Dummy_4 + \varepsilon \quad \text{-----(1)}$$

Both TDM and LTDM have been used as the dependent variable to represent leverage. When we proxy TDM for leverage the equation (1) is transformed to:

$TDM = \alpha + \beta_1 TW + \beta 2LP + \beta_3 JM + \beta_4 BC + \beta_5 TAX + \beta_6 NDTS + \beta_7 PROF + \beta_8 SIZE + \beta_9 CVA + \beta_{10} AGE + \beta_{11} Dummy_1 + \beta_{12} Dummy_2 + \beta_{13} Dummy_3 + \beta_{14} Dummy_4 + \varepsilon$ ------(2)

But when LTDM is used as the leverage ratio then the equation stands as:

$LTDM = \alpha + \beta_1 TW + \beta 2LP + \beta_3 JM + \beta_4 BC + \beta_5 TAX + \beta_6 NDTS + \beta_7 PROF + \beta_8 SIZE + \beta_9 CVA + \beta_{10} AGE + \beta_{11} Dummy_1 + \beta_{12} Dummy_2 + \beta_{13} Dummy_3 + \beta_{14} Dummy_4 + \varepsilon$ ------(3)

Summary of the hypothesis and expected sign of the coefficients for each variable are shown in Table four.

Table 4: Explanatory variables and Expected impacts on Leverage

	Explanatory Variables	Expected impact
Static trade-off theory Variables	Agency Cost:	
	TW	Negative
	LP	Negative
	JM	Negative
	Bankruptcy cost: BC	Negative
	Effective tax rate: TAX	Positive
	Non-debt tax shield: NDTS	Negative
Pecking order theory variables	Profitability: PROF	Negative
	Size: SIZE	Positive
	Collateral value of assets: CVA	Positive
	Age: AGE	Negative
	Dummy variables for industries	Positive/Negative

6. Results

Table five shows the regression results of equation one when LTM (long term debt to market value ratio) has been used to proxy leverage. The regression results of the equation using dependent variable TDM (total debt to market value ratio) are reported in Table six. From these two tables we see that all of the three agency cost variables - TW, LP and JM have negative coefficients as predicted before. However, all of the variables are significant at 1% level in determining only TDM, not LTDM. That shows that firms reduce their total debts when agency costs are intensified. TW and LP also indicate the firm's holding of free cash flow. So the results can be interpreted in the way that the firms tend to repay debts when they have more free cash flows at their disposal. But Long term debt ratio remains unaffected, which implies that only short term debts are settled to reduce agency cost. Now our first hypothesis that higher agency cost should reduce leverage may be accepted if only total debt is counted as the leverage ratio. When we consider the long term debt ratio, we do not have enough evidence to accept the hypothesis. Akhtar (2005) also reported insignificant TW and LP coefficients and significant and negative coefficients of JM variable for long term debt ratios.

Bankruptcy cost (BC) also should have a negative impact on leverage ratios as stated in hypothesis two. But in both regressions we have found positive signs in coefficients for BC. However, none of those coefficients are statistically significant as suggested by their low t-Statistics values. The reason for that may lies in the dearth of practice and implementation of bankruptcy law in Bangladesh. Creditors and firms are not very keen in using the bankruptcy law of Bangladesh, thus cost of bankruptcy is deemed to be ignorable for firms. In short, hypothesis two is not accepted in either case of dependent variables. Akhtar (2005) reported significantly negative BC coefficient for multinational companies only.

Hypothesis three asserts that debts level should be higher if the effective tax rate (TAX) is higher because debts reduce tax burden for the firms. Table five and six suggest that TAX have got positive coefficients as expected in regressions using both TDM and LTDM. But the coefficient is significant only for LTDM not for TDM. That indicates that at higher effective tax rate, firms replace long term debts with short term debts because of high interest cost associated with long term debts to reduce their tax burden. Here hypothesis two may be accepted in case of debt ratio counted by long term debt. Mira (2005) however found a negative relationship between tax rate and debt ratios.

Table 5: OLS Regression results, dependent variable – LTDM, total number of observations is 322. R^2 and adjusted R^2 indicate the goodness of fit test results. DW provides the Durbin-Watson rest results.

Variables	Coefficient	t-Statistic	Prob.
C	-0.885467	-1.915734	*0.0563
TW	-0.055976	-0.531119	0.5957
LP	-2.20E-06	-1.813173	*0.0708
JM	-0.009129	-0.712269	0.4768
TAX	0.025492	2.191509	**0.0292
NDTS	-0.132465	-0.296552	0.7670
BC	0.119693	0.754891	0.4509
PROF	1.37E-05	0.045776	0.9635
SIZE	0.071852	3.020465	***0.0027
CVA	0.010338	0.752089	0.4526
AGE	-0.020297	-0.588120	0.5569
CEM	-0.368660	-2.632034	***0.0089
FUEL	-0.537703	-3.040330	***0.0026
TAN	-0.260998	-2.149409	**0.0324
PHAM	-0.121646	-1.032252	0.3028
R^2	0.087	DW	0.788
Adjusted R^2	0.046	F -stat	2.11

***significant at 1% level
**significant at 5% level
*significant at 10% level

Non-debt tax shield, NDTS should have inverse relationship with leverages as stipulated in hypothesis four because of its substitutability of debts in reducing tax

burdens. The sign of coefficients in both equations conforms to hypothesis four but it is only significant at 5% level in equation two (with total debt). That indicates that firms only reduce short term debt when their depreciation and other non-cash expenditures are high. Therefore hypothesis four is acceptable only when total debt ratio is considered. NDTS was also found an insignificant determinant of long term debt by Akhtar (2005) but significant and negative by Mira (2005).

Hypothesis five stated that leverage should be negatively influenced by profitability of the respective firms. The regression results in both table five and six show that we do not have enough evidence to accept hypothesis five. The coefficients of BC are positive in both cases which are contrary to our previous argument and more importantly both coefficients are insignificant. The positive signs could be explained by the argument that profitable firms will be able to attract more debts from banks and the capital market and these firms will prefer debt in order to reduce their higher tax rate on profit. However, the fact that the coefficients are not significant implies that profitability does not have any material impact on capital structure decision for Bangladeshi companies. Akhtar (2005), Mazur (2007) and Mira (2005) found significant and negative coefficients of profitability variable which conform to the pecking order theory.

Table 6: OLS Regression results, dependent variable – TDM, total number of observations is 322. R^2 and adjusted R^2 indicate the goodness of fit test results. DW provides the Durbin-Watson rest results.

Variables	Coefficient	t-Statistic	Prob.
C	-0.533311	-1.530224	0.1270
TW	-0.245231	-3.657937	***0.0003
LP	-2.81E-06	-4.107748	***0.0001
JM	-0.015772	-2.689963	***0.0075
TAX	0.001438	0.187706	0.8512
NDTS	-1.226543	-2.093677	**0.0371
BC	-0.134522	-1.121386	0.2630
PROF	5.10E-05	0.338955	0.7349
SIZE	0.057480	2.846555	***0.0047
CVA	0.011738	2.199581	**0.0286
L_AGE	0.067242	1.844871	*0.0660
CEM	-0.324489	-2.179874	**0.0300
FUEL	-0.475328	-3.844054	***0.0001
TAN	-0.155594	-2.104971	**0.0361
PHAM	-0.250852	-2.058819	**0.0404
R^2	0.22	DW	0.96
Adjusted R^2	0.19	F -stat	6.29

***significant at 1% level
**significant at 5% level
*significant at 10% level

According to hypothesis six, firm size should be positively related with leverage ratios as bigger firms are considered less risky by the debt investors. Both tables show that the

regression results conform to our expectations as the coefficients are positive and significant. That implies that bigger firms, using their market power and diversification advantages can attract both long term and short terms debts at higher level than their smaller counterparts. Thus we can affirm that hypothesis seven is accepted. This result is consistent with the findings of Akhtar (2005) and Mira (2005) but inconsistent with Mazur (2007) who reported a significantly negative coefficient of size for Polish firms.

Collateral value of assets (CVA) should have a positive impact on firm leverage as asserted in hypothesis seven. Table five shows that the sign of coefficient of CV is positive and significant at 5% level. This result is consistent with our arguments about CVA. However, table six shows that, though sign of the coefficient is positive, the variable does not have any significant impact on the long term debt of the firms. This result is surprising because it is the long term debt which requires firms to attach fixed assets as security of the debts. Thus it becomes very difficult to explain the results regarding the variable, CVA. However, Akhtar (2005) reported a significant positive coefficient for this variable for domestic firms of Australia on long term debts. Finding of Mira (2005) on Spanish firms are similar to Akhter (2005).

Firm age expressed as natural log of years in operation after incorporation (AGE) was hypothesized as having a negative impact on leverage ratios. The tables show contradictory results as the coefficient is positive in table five but negative in table six. Table five shows a positive coefficient of AGE with significant t-Statistic only at 10% level. The positive sign may be explained with the argument that as firms become more mature they enjoy higher trust by the creditors thus can attract higher amount of debts. However, the coefficient is significant only at 10% level in table five and not significant at all in table six. Thus we can conclude that hypothesis eight was not adequately proved.

Hypothesis nine insists that leverage ratio should differ for industry variations. Four dummy variables representing four industries have been used to examine the hypothesis that these industries differ significantly from the textile industry. It is found from the results that cement (CEM), fuel and energy (FUEL), and tannery (TAN) industries are significantly different from textile industry in capital structure decisions. All these industries have a significant coefficient at 5% level in both the equations. The signs are negative suggesting that these industries are less leveraged than the textile industry. Pharmaceutical and chemical industry (PHAM) is not significantly different from textile industry when we consider long term debt ratio but the difference is significant at 5% level when total debt ratio is considered. The sign is also negative for PHAM implies that total debt ratio is lower in this industry compared to the textile industry. Overall, the results show that industry is a significant factor in capital structure determination. Thus we cannot reject Hypothesis nine. Akhtar (2005) also found industry to be a significant determinant of capital structure. Cross industry coefficients of different industries are shown in Table seven. The findings confirm that determinants of capital structure differ significantly across different industries.

Table 7: Cross industry OLS Regression results, dependent variable – TDM.

	Textile	Cement	Coefficient For Fuel and Power	Tannery	Pharmaceutical
C	***-0.273994	***-3.41184	-0.2896	****5.990638	*0.959499
TW	0.1657	***-0.77479	**-0.071776	0.4754	-1.1842
LP	***-0.000012	-3.64E-06	0.0000	0.0000	***-0.0000161
JM	-0.0060	0.011077	**-0.132242	-0.4292	0.0657
TAX	*0.021763	0.014391	*-0.162526	0.0593	***-1.121072
NDTS	-0.2881	***-8.59342	**3.90105	***-11.71254	3.0754
BC	0.9022	-0.159222	0.3342	0.0949	*-0.378695
PROF2	***-0.005278	-0.174266	-0.0319	0.0020	0.0000
SIZE	***0.058256	***0.206762	***0.171277	***-0.339298	0.0094
CVA	0.0002	0.073402	***-1.164629	***0.921131	*0.165666
L_AGE	***-0.053446	-0.052879	***-0.771199	***0.51086	-0.1259
R-squared	0.377688	0.849937	0.997796	0.885481	0.73937
Adjusted R-squared	0.3362	0.787411	0.995592	0.855344	0.681452
Durbin-Watson stat	0.448104	1.081775	1.462861	0.840766	0.717393
F-statistic	9.103653	13.59327	452.6914	29.38216	12.76584

***significant at 1% level
**significant at 5% level
*significant at 10% level

In both the equations (shown in table five and six), R^2 and adjusted R^2 values show that the independent variables could not explain much about the variability of the debt ratios. However, previous studies show similar explanatory power of the independent variables used in this study, such as Akhtar (2005) has showed R^2 values of 21%, 18% and 22% for three different models. One major concern of this study is the low Durbin-Watson stat values, which indicate that the regressions might be affected by autocorrelation or serial correlation of residuals. In that case, we can have biased standard errors and R^2 and F statistic values can also become unreliable. Moreover, the Hausman test results for random effect model reveal that the chi-sq statistics are too big and provide adequate evidence against the null hypothesis that there is misspecification in the model. We could not use the fixed effect model also because of having four dummy explanatory variables. That is why we used a Tobit regression model in order to verify our previous results. Results from the Tobit regression is shown in table eight.

Table eight reveals that regression results are similar in Tobit models as to the OLS random effect models. Two agency cost variables, TW and LP have been shown to have significant negative impact on debt ratios. Tax rate and Non-debt tax shield variables are found to be not significant for either form of debt ratios. Bankruptcy cost is found here significant for total debt which differs from our previous finding. Profitability

and collateral value of assets do not have significant coefficients in this regression while size is found to have significantly positive impact on debt ratios. Age of the firms is negatively related with long term debt only, which is consistent with our previous findings. Industry is again found as a significant determinant of capital structure with the exception of pharmaceutical and chemical industries. Thus the similarities of Tobit regression results with OLS regression results show the verifiability of the latter.

Table 8: Tobit regression results, dependent variables TDM and LTDM, significance is shown in z-statistics

Variables	Coefficient for TDM	z-Statistic	Coefficient for LTDM	z-Statistic
C	-0.119253	-0.418747	0.279198	0.835058
TW	-0.669478	***-4.363141	-0.417780	**-2.319169
LP	-1.36E-05	***-7.920467	-8.16E-06	***-4.041701
JM	0.004334	0.187346	0.029360	1.081113
TAX	0.001084	0.044495	-0.003467	-0.121256
NDTS	-1.173586	*-1.908529	-1.106934	-1.533300
BC	-0.917932	***-2.998715	-0.008864	-0.024665
PROF	-0.000864	-1.380015	-0.001439	*-1.958819
SIZE	0.053054	***4.004401	0.031955	**2.054350
CVA	0.030271	1.202943	0.055733	*1.886460
L_AGE	-0.041351	-1.241913	-0.144671	***-3.700918
CEM	-0.250077	***-4.785881	-0.350743	***-5.717410
FUEL	-0.227085	***-3.305915	-0.282421	***-3.502050
TAN	-0.146179	***-3.485177	-0.249943	***-5.075776
PHAM	-0.117152	***-2.583431	-0.023330	-0.438217

***significant at 1% level
**significant at 5% level
*significant at 10% level

7. Conclusion

An OLS regression method has been applied to find out determinants of capital structures of Bangladeshi listed companies. The determinants are selected based on two prominent theories of capital structure, static trade-off theory and pecking order theory. Previous studies have been analyzed to find the possible determinants. Data from 46 companies listed in Dhaka Stock Exchange (DSE) for seven years (1999 – 2005) has been collected from respective annual reports of the companies. Total number of observations was 322. OLS regression for panel data with cross section random effects was run with two equations. Total debt to market value of the companies was used as the leverage ratio in one equation and long term debt to market value was used in another equation. The results show that agency costs are negatively affecting the total debt ratios of Bangladeshi companies. Tax rate is having a positive impact only on long term debt and non debt tax shields such as depreciations are negatively impacting total debt ratios. Bankruptcy costs and profitability are irrelevant in determining leverage ratios, while firm size has a positive impact. Collateral value of

assets positively influence only total debt ratio whereas number of years in operation does not have very significant impacts. Another variable, industry characteristic has been found to be significant in determining debt ratios.

The results will be more reliable if number of observations can be increased. But absence of established databases in Bangladesh makes data collection fairly difficult. Robustness of the study could be increased by including a survey on the decision makers of capital structure of firms. Personal traits of the managers such as their personal risk tolerance can have impacts on firms' capital structure decision. Further scopes are there to do similar studies by adding more observations and variables. Besides, further studies can be directed towards finding the optimal capital structure for Bangladeshi companies.

References

Akhtar, S 2005, 'The determinants of capital structure for Australian multinational and domestic corporations', *Australian journal of management,* vol. 30, no. 2, pp. 321-341.

Antoniou, A, Guney, Y, & Paudyal, K 2008, 'The determinants of capital structure: capital market-oriented versus bank-oriented institutions', *Journal of Financial and Quantitative Analysis,* vol. 43, no. 1, pp. 59-92.

Bevan, A A, & Danbolt, J 2002, 'Capital structure and its determinants in the UK - a decompositional analysis', *Applied Financial analysis,* vol. 12, no. 3, pp. 159-170.

Chkir, IE. & Cosset, JC 2001, 'Diversification strategy and capital structure of multinational corporations', *Journal of Multinational Financial Management,* vol. 11, no. 1, pp. 17-37.

DeAngelo, H, & Masulis, RW 1980, 'Optimal capital structure under corporate and personal taxation', *journal of Financial Economics,* vol. 8, no. 1, pp.3-29.

Eldomiaty, TI 2007, 'Determinants of corporate capital structure: evidence from an emerging economy', *International Journal of Commerce and Management,* vol. 17, no. 1/2, pp. 25-43.

Fattouh, B, Harris, L, & Scaramozzino, P 2008, 'Non-linearity in the determinants of capital structure: evidence from UK firms', *Empirical Economics,* vol. 34, pp. 417-438.

Graham, JR, & Harvey, CR 2001, 'The theory and practice of corporate finance: evidence from the field', *Journal of Financial Economics,* vol. 60, no. 2-3, pp. 187-243.

Jensen, GR, Solberg, DP, & Zorn, TS 1992, 'Simultaneuos determination of Insider ownership, debt and dividend policies', *Journal of Financial and Quantitative Analysis, vol. 27, no.* 2, pp. 247-264.

Jensen, J, & Meckling, W 1976, 'The theory of the firm: managerial behaviour, agency costs, and capital structure', *Journal of Financial Economics,* vol. 3, pp. 305-360.

Kim, H, Heshmati, A, & Aoun, D 2006, 'Dynamics of capital structure: the case of Korean listed manufacturing companies', *Asian Economic Journal,* vol. 20, no. 3, pp. 275-302.

Lehn, K, & Poulsen, A 1989, 'Free cash flow and stockholder gain in going private transactions', *The journal of Finance,* vol. 44, no. 3, pp. 771-787.

Mazur, K 2007, 'The determinants of capital structure choice: Evidence from Polish companies', *Int Advanced Econ Res,* vol. 2007, pp. 495-514.

Mehran, H 1992, 'Executive incentive plans, corporate control, and capital structure', *Journal of Financial and Quantitative Analysis,* vol. 27, pp. 539-559.

Mira, FS 2005, 'How SME uniqueness affects capital structure: Evidence from a 1994-1998 Spanish data panel', *Small Business Economics,* vol. 25, pp. 447-457.

Modigliani, F, & Miller, MH 1958, 'The cost of capital, corporation finance and the theory of investment', *American Economic Review,* vol. 48, pp. 261 - 297.

Modigliani, F, & Miller, MH 1963, 'Corporate Income taxes and the cost of capital: A correction', *American Economic Review,* vol. 53 no. 3, pp. 433-443.

Myers, SC 1977, 'Determinants of corporate borrowing', *Journal of Financial Economics,* vol. 5, pp. 147-175.

Myers, SC 1984, 'The capital structure puzzle', *Journal of Finance,* vol. 39, pp. 575-592.

Myers, SC, & Majluf, NS 1984, 'Corporate financing and investment decisions when firms have information that investors do not have', *journal of Financial Economics,* vol. 13, pp. 187-221.

Rajan, RG, & Zingales, L 1995, 'What do we know about capital structure? some evidence from international data', *The journal of Finance, vol. 10, no* 5, pp. 1421-1460.

Titman, S, & Wessels, R 1988, 'The determinants of capital structure choice', *The journal of Capital structure Choice,* vol. 43 pp. 1-18.

Warner, JB 1977, 'Bankruptcy cost: some evidence', *The journal of Finance, vol. 32, no.* 2, pp. 337-347.