

# Capital Structure Determinants: Evidence from Pharmaceuticals & Chemicals Industry of Bangladesh

Ummay Mahima Ima & Nurun Nahar

## Abstract

This paper aims to determine the factors affecting the capital structure choice of a company. Panel data of 15 listed pharmaceuticals and chemicals companies of Bangladesh have been chosen for this study. A multiple regression model was applied here to find out the determinants of capital structure by using this panel data. It considered agency cost of equity, agency cost of debt, bankruptcy risk, growth rate, profitability ratio, and operating leverage as determinants of the leverage level of a firm. The study presented that an 87% variation in the debt ratio of the companies in the pharmaceuticals & chemicals industry can be explained by the variables selected for this study. That means the regression is a good fit for the study. All six determiners except growth rate showed a significant impact on the capital structure of a company in the pharmaceuticals & chemicals industry of Bangladesh. Most of the variable's signs matched the initial assumptions. The capital structure of the pharmaceuticals and chemicals business in Bangladesh can be described using agency cost theory and static trade-off theory, according to this empirical study.



IJSB

Accepted 13 July 2022  
Published 16 July 2022  
DOI: 10.5281/zenodo.6845515

**Keywords:** *Agency theory, capital structure determinants, financial leverage/capital structure/debt ratio, MM theory, pecking order, trade-off theory.*

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## 1. Introduction

A firm's capital structure is crucial because it reflects how the firm finances its assets, which is often through a combination of equity and debt. An accurate capital mix will increase the value of the firm whereas an incorrect one will lead the firm towards financial difficulties. The process of deciding the company's financial structure is intimately tied to the level of earnings and potential losses that the company's shareholders will experience. Therefore, management must decide on the best financial structure for the business to ensure its long-term success. The process of identifying a company's capital structure continues to rely heavily on the two modern capital structure theories proposed by [1] "the trade-off theory" and [2] "the pecking order theory". As a result of this issue, various capital structure theories (such as the MM theory, trade-off theory, agency theory, and pecking order theory) were developed with the aim of supporting businesses in choosing the appropriate capital structure. Nevertheless, the conclusions derived from these models to interpret the capital structure decisions of enterprises remain disputed. Furthermore, the elements that determine the appropriate capital structure of companies have been the subject of lengthy disputes. Over the years, numerous studies have been conducted on these concerns. However, empirical study has not been able to provide sufficient solutions. This area is still under research in Bangladesh. This study is mainly conducted based on the pharmaceuticals and chemicals industries. As 98 percent of the country's overall need for medicine is fulfilled by domestic institutions, the pharmaceutical industry in Bangladesh is advancing with significant potential. In addition to serving domestic demand, the enterprises export pharmaceuticals to a number of international markets. Presently, there are over 257 pharmaceutical businesses in Bangladesh that produce approximately 80% of generic medications. Currently, indigenous businesses such as Square, Beximco, Reneta, and Opsonin dominate the Bangladeshi pharmaceutical sector. Here the sole intention of the study is to discover the determinants of the capital structure of the pharmaceutical industry and also to see the relationship between the dependent and independent variables. Here, the variables include debt ratio which is the dependent variable of this study. Six variables have been used as independent variables. These are Agency- Equity, Agency- Debt, Bankruptcy Ratio, Growth Rate, Profitability Ratio, and Operating Leverage.

## 2. Review of Literature:

While analyzing the capital structure pattern in Bangladesh, some of the previous studies on the capital structure were analyzed. Some of them suggest that developing countries get similar determinants for capital structure. Some of the famous studies on capital structure decisions have been reviewed. Bab Shah et al. (2022) carried out a study on a firm's capital structure by taking a total of 480 firms from South Asian countries. From the study, it was found that tangibility, tax, volatility, profitability, and NDTS explain the capital structure of any firm. The findings were similar to pecking order, agency cost, and Static trade-off theory expectations, indicating that Western capital structure models and modern finance theories are effective for South Asian developing countries. Nabil Khouri (2022) also conducted a study in which he evaluated 207 non-financial Algerian firms' capital structure factors (2013-2017). The results of the Tobit panel random effects model are as follows: Profitability, tangibility, the debt-tax shield (DTS), and the non-debt tax shield (NDTS) are the firm-level factors at the 1 percent level. Moreover, Faraj Salman Alfawareh et al. (2021) conducted a study based on the capital structure of Non- Financial Firms in Jordan. Variables from theories and literature form the research framework. This study employed business size, assets tangibility, liquidity, profitability, growth potential, and risk as independent variables, and leverage as a dependent variable. It was found that size, asset tangibility, and profitability have a positive relation with leverage. On the other hand, liquidity, growth opportunities, and

risk have a negative impact on leverage. Septiana Arianti and Fadilla Cahyaningtyas (2022) found in their study conducted on the capital structure (Food and Beverage sector listed on IDX) that profitability has a favorable effect on capital structure. Neither asset structure nor business risk influences the capital structure of a corporation. Using liquidity, firm growth, and business risk variables, Nur Afriliyati et al. evaluated in 2022 a study whose objective was to identify the elements affecting the firm's CSTR in the consumer goods industry listed firm during the period of 2016 to 2020. Only the LQDS has a negative influence on the company's CSTR in the consumer products business, while FMGH and BSRK have no effect. Sofat and Singh (2017) say the pecking-order theory is relevant to profitability and the trade-off theory to tangibility and profits volatility. No theory can explain capital structure decisions (Hamzah & Marimuthu, 2018; M'ng, Rahman, & Sannacy, 2017). Imtiaz et. al. (2016) studied the standard error model utilizing six variables: profitability, growth, size, liquidity, tangibility, and operating leverage. The empirical study reveals that the static trade-off theory and the pecking order theory dominate in Bangladeshi pharmaceutical enterprises. Hossain & Hossain (2015) used a different model to show the relationship between different variables and capital structure. Managerial ownership boosted Growth rate, debt coverage ratio, profitability, tax shield, financial expenses, free cash flow, and agency costs affect capital structure. According to this study, Pecking-order and Static Trade-off theories dominate Bangladesh's capital structure. Along with this Graham and Harvey (2001) and Frank and Goyal (2007) established that financial flexibility, expected inflation, and credit rating are more highlighted in the USA. They gave less significance to tax benefits, asymmetric information, free cash flow, and some other determinants of capital structure. In India, it was claimed by Mishra (2011) that tangibility, profitability, and tax are more significant factors in manufacturer companies whereas size, volatility, and credit rating are the less emphasized factors here. From the evidence of Chinese companies, Huang and Song (2002) developed that variability, size, and ownership of a company are positively related to leverage where tax shield and profitability are inversely related to leverage, and tax and shareholding of the management have no significance on the capital structure. Chowdhury (2004) was a pioneer in analyzing capital structure factors in Bangladesh and Japan. Leverage was the dependent variable, with six independent variables. Agency debt cost, growth rate, profitability, operating leverage, and bankruptcy risk influence both nations' enterprises' capital structure choices. Company and agency structures differ due to institutional variations. Japan manages agency conflicts better than Bangladesh. Jahan (2014) analyzed the textile sector of Bangladesh and used Leverage, Tangibility, Profitability, Size, and Growth as determinants of capital structure. She used panel data while analyzing the model. It was shown that the two elements that affected capital structure the most were tangibility and profitability. The model was supported by tradeoff theory and agency cost theory. Lima (2009) endeavored to work on the capital structure by taking the pharmaceutical companies of Bangladesh. She used agency cost of equity, bankruptcy, risk growth rate, operating leverage, tangibility, and debt service capacity as the determinants of capital structure. She found that the independent variables describe 69% variation in the dependent variable. It is evident from the aforementioned literature that a large number of research were conducted in different nations using different models and industrial sectors, with inconsistent results. So there is a deficiency in this area. In this research, we shall examine the determinants of capital structure within the Bangladeshi pharmaceutical industry.

### **3. Sample and Data:**

To conduct the study Pharmaceuticals and Chemicals industry was selected. The population data were collected from Dhaka Stock Exchange (DSE) library mainly. The annual reports were collected and the data required for each variable are taken and structured from these

reports. The companies selected under these industries are listed under DSE. The sample data from the population were taken based on the availability of data for the total time period. After Attempting with all the companies in the Pharmaceuticals & Chemicals industry, 15 companies were selected in this industry. The time span was from 2004 to 2021. The summary data for the Pharmaceuticals & Chemicals industry contains the mean, variance, minimum and maximum value of the data set of this industry. The summary is given in table 1. From table 1, it can be seen that in this industry on average 33% debt ratio is maintained. The average shareholding by large shareholders is around 52%. The short-term to long-term debt ratio is around 76% which shows that short-term loan is less than long-term debt. The bankruptcy risk is 1.068. The Growth rate is 13% on average.

**Table 1: Summary data of the Pharmaceuticals & Chemicals industry**

Variables	Observations	Mean	Standard Deviation	Min	Max
Debt Ratio	15	0.337509	1.715263	0.06	0.666
Agency-Equity Cost	15	0.5227533	0.1589176	0.3	0.89
Agency - Debt Cost	15	0.76844	0.1801043	0.4259103	0.9943982
Bankruptcy Ratio	15	1.068645	0.587269	0.4854041	2.753211
Growth Rate	15	0.1314795	0.0777798	0.0288639	0.25
Profitability Ratio	15	0.104368	0.0777695	-0.0427035	0.25
Operating Leverage	15	2.454176	2.368102	-2.509308	7.030733

The profitability ratio is 10% which is quite good. The operating leverage is 2.45 on average. The most deviation is observed in operating leverage and the least is observed in the profitability ratio.

#### 4. Variables, Model, and Estimation:

The study was intended to test the capital structure determinants based on a model which is similar to that of Dodd (1986). The study used a multiple regression model. The variables include debt ratio which is the dependent variable of this study. Six independent variables have been used in this study. These are Agency- Equity, Agency- Debt, Bankruptcy Ratio, Growth Rate, Profitability Ratio, and Operating Leverage. The econometric model of the variables is shown below:

$$\text{Capital Structure} = \alpha + \beta_1 * \text{Agency- Equity} + \beta_2 * \text{Agency- Debt} + \beta_3 * \text{Bankruptcy Ratio} + \beta_4 * \text{Growth Rate} + \beta_5 * \text{Profitability Ratio} + \beta_6 * \text{Operating Leverage} + \varepsilon$$

Here,

$\alpha$  = Constant

$\beta$  = slopes of the independent variables of the regression

$\varepsilon$  = Error

In this study Debt ratio is the dependent variable. This is measured by dividing the total debt of a company by the total asset of the company. Here book value is used in computing total debt and total equity. Total debt is calculated by using short-term as well as long-term debt. The independent variables are the explanatory variables on which the debt ratio is reliant.

The first independent variable is the agency equity cost. Agency equity cost is the cost of conflict between managers and shareholders. The number of shares held by large shareholders is used as a proxy for this variable. Different studies by Hindley (1970) and others used the amount of common share held by directors and managers (in percentage) as this variable. The agency equity cost is expected to be inversely related to the debt ratio. Another independent variable is the agency debt cost. In this study, the proxy used for this is the ratio of short-term to total debt. Here short-term debt is used because it is expected that shorter maturity debt has lower agency debt costs. So, it is observed that the firms with high short-term debt are expected to have less agency debt cost. On the other hand, firms with lower short-term debt are expected to have higher agency debt costs. So, the relationship is expected to be positive between debt ratio and agency debt cost. The next variable is the bankruptcy cost. When any firm faces bankruptcy, it has to go through a formal bankruptcy process in court. This legal process is very expensive. This includes legal costs and administration costs. At the same time, there is a very high chance of bankruptcy. So, when bankruptcy risk is high, the firm should reduce the debt ratio. So, the relationship between bankruptcy cost and debt ratio is expected to be negative. But Fama (1980) argued that even if bankruptcy is conceivable, corporations cannot change the entire market value of outstanding securities by issuing or retiring any type of security if the capital market is perfect. Another independent ratio includes the growth rate. According to earlier research (Toy et. al., 1974), the growth variable is defined as the firm's asset growth rate. Therefore, the proxy used for growth rate is the ratio of Earnings before Interest and Tax (EBIT) and Total Asset (TA). The relationship expected between these two variables is positive.

**Table 2: Summary of the expected effect**

Independent Variables	Expected Effects
Agency- Equity Cost	Negative
Agency- Debt Cost	Positive
Bankruptcy Risk	Negative
Growth Rate	Positive
Profitability Ratio	Negative
Operating Leverage	Negative

Profitability is one of the six independent variables. Potentially profitable businesses are better equipped to cover expenses. They use more internal funds to pay expenses. So for this type of firm, the equity is higher. The proxy for this variable is "Earnings before Interest and Tax" (EBIT). There should be a negative relationship between these two variables. Operating leverage is the last independent variable which is measured by the portion of fixed costs that should be used in the operation of any company. When a firm uses a great amount of fixed cost, it has a high degree of operating leverage. The proxy for this variable is the ratio of percentage change in EBIT to the percentage change in sales. It is expected to have a negative relationship with the debt ratio. The summary of the expected effects of the independent variables is given in table 2.

## 5. Results and Discussions

The regression result of the Pharmaceuticals and Chemicals industry is given in table 3. The table shows the coefficient and the t value of each determinant of capital structure. There is a significant relationship between capital structure and most of the variables.

**Table3: Regression Result of Pharmaceuticals & Chemicals industry**

Dependent Variable: Debt Ratio	Coefficient	P>  t
Agency Equity	0.4831*	0.015
Agency Debt	0.7775*	0.002
Bankruptcy Risk	-0.231*	0.001
Growth Rate	-0.43989	0.211
Profitability Ratio	-1.3037*	0.002
Operating Leverage	-0.03195*	0.023
R Square	<b>.8749</b>	
Adjusted R Square	.7810	
F Statistics	9.32	
Standard Error Estimate	.1981571	

The model says that in table 3, the R square of the model is 87.49% which is very good. This shows that the 87.49% variation in the debt ratio can be explained by the independent variable. This shows a very strong explaining power of the model. The adjusted R square is also fairly high which is 78.10%. So the adjusted explanatory power of the model is 78.10%. The F statistics value is 9.32 which represents the overall significance level of the model. Here the F value shows that there is a linear relationship between the dependent and each independent variable. So overall the model is quite strong. From table 3, we can also see that all the variables except agency cost of equity and growth rate have a coefficient sign matched with the initial assumptions. All the variables excluding growth rate are significant at a 5 % significance level. In this study, no multicollinearity problem was found in the data set. The multicollinearity can be tested by analyzing the correlation matrix. The correlation matrix is shown in table 4 for the Pharmaceuticals and Chemicals Industry. When values of this correlation matrix are more than 0.5, there exists multicollinearity. So here in table 4, only operating leverage and agency debt has a value of more than 0.5. Other than this all the variables have a value less than 0.5. So it can be said that the dataset has no multicollinearity problem.

**Table 4: Correlation matrix of the Pharmaceuticals & Chemicals Industry**

Specification	DR	AE	AD	BR	GR	PR	OL
AE	AE   0.0158	1.0000					
AD	AD   0.4309	-0.4722	1.0000				
BR	BR   -0.4332	0.0168	-0.0540	1.0000			
GR	GR   -0.1761	0.2042	-0.3865	-0.3248	1.0000		
PR	PR   -0.2983	0.0779	0.0941	-0.3556	0.1226	1.0000	
OL	OL   0.0862	-0.1218	0.5401	-0.2703	-0.1430	0.1716	1.000

But we can also check this through the VIF test in table 5. The VIF test result for Pharmaceuticals and Chemicals Industry says there is no value greater than 10. So, independent variables are not correlated in this study.

**Table 5: VIF Test**

Variable	VIF	1/VIF
Agency- Equity cost	2.1	0.477299
Agency – Debt cost	1.6	0.626865
Bankruptcy Risk	1.39	0.71759
Growth Rate	1.37	0.728174
Profitability Ratio	1.36	0.735565
Operating Leverage	1.18	0.847512
Mean VIF	1.5	

So, the variables that have been chosen for this study show that most of them have a significant impact on the debt ratio of a firm. The coefficient signs also mostly matched with the previously sets assumptions. The data set is also free from multicollinearity as the correlation matrix and VIF test show no multicollinearity here. We can say that the capital structure of the pharmaceuticals and chemicals industry significantly depends on the variables of our study.

## 6. Conclusion

This research seeks to identify the factors influencing the capital structure of the pharmaceuticals and chemical industry of Bangladesh. For this analysis, 16 years of data from 15 companies have been used. The result shows that most of the independent variables selected for this study have a significant impact on the capital structure of a company. Among the six independent variables, four have the same signs of coefficient as the initial assumptions. Five of the independent variables are significant at a 5% significance level. Previous studies have also proved the result. A wide range of studies have been done on this topic but no study could give a definite result. So the main purpose of that study was to get a proper result targeting only one sector of the whole market. As the capital structure is a very crucial decision for the management of any company. This study will help them decide on the optimum mix of capital structures. This topic is one of the major topics which should be analyzed by researchers. Thereby, future researchers may use this study as a direction for their research. The stakeholders of any company can also get support from this paper. Overall, this paper may meet different requirements from different relevant sectors.

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## Appendix:

**Table A.1: List of the 15 companies**

Serial No.	Company Name
1.	ACI Limited
2.	Ambee Pharma Ltd.
3.	Beximco Pharmaceuticals Ltd.
4.	Beximco Synthetics Ltd.
5.	GlaxoSmithKline (GSK) Bangladesh Ltd.
6.	The IBN SINA Pharmaceutical Industry Ltd.
7.	Imam Button Industries Ltd.
8.	Keya Cosmetics Ltd.
9.	Kohinoor Chemicals Company (Bangladesh) Ltd.
10.	Libra Infusions Limited
11.	Orion Infusion Ltd.
12.	Pharma Aids
13.	Reckitt Benckiser(Bd.)Ltd.
14.	Renata Ltd.
15.	Square Pharmaceuticals Ltd.

Table A.2: Raw result of regression

. reg DR AE AD BR GR PR OL						
Source	SS	df	MS	Number of obs = 15		
Model	.360357882	6	.060059647	F( 6, 8)	= 9.32	
Residual	.051539936	8	.006442492	Prob > F	= 0.0030	
Total	.411897818	14	.029421273	R-squared	= 0.8749	
				Adj R-squared	= 0.7810	
				Root MSE	= .08027	
DR	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
AE	.4831023	.1573912	3.07	0.015	.1201577	.846047
AD	.7774567	.1724024	4.51	0.002	.3798959	1.175017
BR	-.2309984	.0431209	-5.36	0.001	-.3304353	-.1315614
GR	-.4398886	.3232054	-1.36	0.211	-1.185202	.3054243
PR	-1.303654	.2996267	-4.35	0.002	-1.994594	-.612713
OL	-.0319511	.0114413	-2.79	0.023	-.0583348	-.0055674
_cons	.0067017	.1981571	0.03	0.974	-.4502494	.4636528

## Cite this article:

**Ummay Mahima Ima & Nurun Nahar** (2022). Capital Structure Determinants: Evidence from Pharmaceuticals & Chemicals Industry of Bangladesh. *International Journal of Science and Business*, 13(1), 122-130. doi: <https://doi.org/10.5281/zenodo.6845515>

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