UITS Journal of Business Studies ❖ **Volume: 8-9, Issue: 1**
ISSN: 2707-4528 (Print) ISSN: 2707-4536 (Online), October 2021- September 2023

A Study of Determining Bangladesh's Pharmaceutical and Chemical Industry's Capital Structure Factors

Md. Hossen Miazee [1], Janifar Alam [2], Monzurul Islam Utsho [3], Quazi Nur Alam [4]

ABSTRACT: ***Capital structure is a crucial element in determining the performance and success of a firm to a large extent. Determination of capital structure comes with the risk of trading off the firm's debt and equity levels to find out the best option of financing so that the firm's value increases. This study focuses on the factors determining the capital structure decision of 18 companies in the Pharmaceuticals & Chemicals Industry in Bangladesh which are listed in Dhaka Stock Exchange for 10 years. Ordinary Least Squares regression technique is used to determine the relationship between the dependent variable and the independent variables used in the study. Agency cost of equity and Bankruptcy risk are found to positively influence the debt ratio while Profitability ratio is found to have a negative effect on it. The study hence confirms the attributes of the Pecking Order Theory in the case of pharmaceutical companies in Bangladesh.***

Keywords: Agency Cost of Equity, Agency Cost of Debt, Capital Structure, Operating Leverage, Profitability.

1. INTRODUCTION

Determination of optimum capital structure is one of the crucial tasks for a firm when deciding for new and efficient sources of financing. The role of agency costs in determining capital structures has been discussed by several authors including Jensen and Meckling [10] and Myers [18]. If the debt to equity mixture is improper, the value of the firm may decrease and, similarly

[1] Assistant Professor, Department of Business Studies, UITS.
Email: hossen.miazee@uits.edu.bd
[2] Assistant Professor, Department of Business Studies, UITS.
* Corresponding author: Email: janifar.alam@uits.edu.bd
[3] Lecturer, Department of Business Studies, UITS.
Email: monzurul.islam@uits.edu.bd
[4] Lecturer, Department of Business Studies, UITS.
Email: nur.alam@uits.edu.bd

the firm may lose its stability. Moreover, having too much debt may cause the firm to become bankrupt. So, an optimum mixture of debt and equity is one of the most crucial questions that a firm should emphasize on answering. Though various studies have been done internationally on this topic, still this area is under research in Bangladesh. The initial attempt regarding this had been done by Haque [7], Chowdhury [4], and Lima [12]. This study attempts to analyze the recent capital structure pattern of Bangladeshi business firms' and compare the result with the previously analyzed data. Past researches show that there are dissimilarities in outcome of different research works.

The expected theoretical signs are different, and the significance of level of variables is also different in various studies. The observed coefficient signs are also different from the expected ones. And the cost of different capital structure is different. When debt is taken, the debt holders are paid interest on a timely basis. So, if the debt burden is high, the company may face bankruptcy as the cost will be higher. Consequently, optimum capital structure is crucial for a firm to avoid risk of bankruptcy. So, the study mainly focuses on analyzing current data of Pharmaceuticals & Chemicals Industry and comparing the data with the previous studies.

2. THEORETICAL DEVELOPMENT AND LITERATURE REVIEW

Capital structure theories try to show how the financing decision is taken through different financing mix. Probably no area of finance has been given so much attention than the capital structure problem issue. The problem of deciding the optimum capital structure for financing decision of the firm is one of the crucial issues both in practice and theory regarding the financial management. There always exists a general controversy about what optimum compositions of debt equity mix will accelerate the value maximization process.

2.1 Theoretical Development

Over the last few decades, a wide range of theories have appeared in the literature of finance. A broad range of factors including a mix of tax effects, bankruptcy costs, asymmetric information and various agency problems associated with different securities have to be considered while determining the optimum capital structure for a firm. Frictionless Market Theories and Costly Transaction Theories; these are the two broad groups categorization of theoretical developments of capital structure. The original capital structure theories of Modigliani and Miller [15], Miller [14], and DeAngelo and Masulis [5] are included in the first group which group assumes that individuals and firms can buy or sell securities without incurring transaction costs. And a range of theories that captures the various effects of costly capital market transactions are included in the second group. Pecking Order

Theory developed by Donaldson; Debt Capacity Theory developed by Robichek and Myers [18]; The Agency Models by Jensen and Meckling [10], Myers [18], Smith and Warner [23]; and Signaling Model by Ross [20] are included in the second group which are the Costly Transaction Theories.

2.1.1 Miller and Modigliani Theory (M & M Theory)

Modigliani and Miller proposed the modern theory of capital structure in 1958 in the article titled "The Cost of Capital, Corporation Finance and the Theory of Investment" through which historical backdrop of the present-day hypothesis of capital structure began. Modigliani and Miller began in their studies with the assumption that firms have a certain set of expected cash flows. And firms divide up whole cash flow to the investors at the time of selection of specific debt and equity ratio to finance a particular project. As a result, investors have the access similar to firms to the financial markets.

In their studies, they explained that in the perfect market, the selection of a firm's capital structure could not affect its market value since investors' ability to make or unmake homemade leverages of any amount they preferred by lending or borrowing on personal account. And if the value of the firm is affected by the choice of a firm's capital structure then arbitrage opportunity may exist there, and it is difficult to find perfect market in the real world. Modigliani and Miller again added the impact of tax on the cost of capital and value of the firm in their following propositions in 1963.In the new proposition, they add that value of the firm depends on the variety of debt level and benefits from the tax shield on interest payments. In the year of 1976, Miller presents the following version of the capital structure irrelevancy theory. Miller [14] stated that none of the personal and corporate tax statuses are relevant to the choice of firm's capital structure.

2.1.2 Trade off Theory

The trade-off theory of capital structure was developed by Kraus and Litzenberger [11] and this theory suggests that there is an optimal capital structure that maximizes the value of the firm in balancing the costs and benefits of an additional unit of debt and so managers try to get the benefits of interest tax shields against the present value of the potential financial distress costs. According to this theory, capital structure should be determined at the point where the cost of tax savings and cost of financial distress are balanced.

2.1.3 Agency Cost Theory

The cost that arises because of the conflict between the major shareholders

and the managers of a firm is called agency cost and the theory which deals with this cost is called agency cost theory. According to Jensen and Meckling [10], agency costs are the sum of the monitoring expenditures of the principal, the bonding expenditures by the agent and the residual loss. Because of the conflicts, the cost of the relationship between managers and stockholders incline to discourage the issuance of equity and the costs of the relationship between the debtholders and stockholders tend to discourage the use of debt. And firms' optimum capital structure should reflect a balance of these costs.

2.1.4 Pecking Order Theory

Pecking order theory is about information asymmetry between managers and external investors. The theory has been developed as an alternative theory to the trade -off theory because this theory is based on the asymmetric information rather than using corporate taxes and financial distress into the MM propositions. Asymmetric information means that managers know more about the firm's prospect compared to the shareholders and consequently their activities provide a signal to investors about the prospects of the firm. This theory assumed that firms with more profitability will issue less debt and more likely finance their activities with internal funds through retained earnings. Mostafa & Boregowda [16] stated that small firms with more growth opportunities should issue more debt than equity.

2.1.5 Market Timing Theory

Market Timing Theory is another theory of capital structure which is pioneered by Baker and Wulgler [2].This theory of capital structure assumes that firms will issue new stock when the stock price is assumed to be overvalued (high price) and repurchase their stock price when it is perceived to be undervalued (low price) (Luigi & Sorin [13]; Mostafa & Boregowda, [16]; and Baker et al. [2]).

2.1.6 Signaling Theory

Signaling theory was first introduced by Ross [20] which is completely opposite to pecking order theory. This theory states that the choice of the mix of capital structure reflects onto the outside investors the information of the insiders. Ross [20] noted that the signaling theory states that taking more debt is a signal to the investors that the company is doing well and going to generate positive cash flow in its upcoming financial year. And fixed amount of interest and principal will be paid by using these positive cash flows. Large amount of debt indicates the manager's confidence in the company's future performance and its ability to generate future cash flows.

2.2 Literature Review

Myers [18] supports the theory and stated in his studies that debtholders prefer shorter maturity debt securities to ensure frequent renegotiation of interest rates and term of debts by recognizing the increased potential of bankruptcy because agency-debt cost could be reduced by lowering the probability of increasing debtholders risk by means of shorter maturities of debt. Huang and Song [9] developed research studies from the evidence of Chinese companies that Volatility, size and ownership of institutions have positive relationship with leverage and profitability and non-debt tax shield have negative relationships with leverage. Chowdhury [4] was the pioneer in our country and in his study, he analyzed determinants of capital structure by utilizing evidence from two countries-Bangladesh and Japan.

This study mainly focused on the cross-sectional differences in debt ratios between firms in Japan and Bangladesh and the study is based on the agency cost model of capital structure. In this study, there were six independent variables which were agency cost of debt, agency cost of equity, profitability, growth rate, operating leverage and bankruptcy risk and the dependent variable was leverage or debt ratio. And each of the six independent variables have significant influence on the capital structure choice of both countries' firms. The empirical results of this study found that due to institutional differences, the structure of firms of Japan and Bangladesh agency structure are different. Moreover, Japanese financial institutions have better management to mitigate the agency conflicts more effectively whereas Bangladeshi firms are less efficient to manage the agency conflicts.

Frank and Goyal [6] established that financial flexibility, expected inflation, credit rating are more highlighted in the USA and tax benefits, asymmetric information, free cash flow and some other determinants of capital structure had been considered as less significant . Mustafa and Osama [17] examined the effect of capital structure on the performance by using multiple regression model represented by ordinary least squares (OLS) and the results of the study was that capital structure associated negatively and statistically with firm performance on the study sample generally.

Moreover, the study concluded the fact that between high financial leverage firms and low financial leverage firms, there was no significant difference to the impact of the financial leverage and their performance. At last, the study also showed that there is almost no difference between the financial leverage of high growth firms and low growth firms on the performance based on the growth of the firms. Lima [12] worked on Capital structure and in her study, she mainly focused on one industry of Bangladesh which is Pharmaceutical

Industry. In her study of Pharmaceutical Companies of Bangladesh, she considered growth rate, operating leverage, bankruptcy risk, and agency cost of equity, tangibility and debt service as the capital structure determinants. And she concluded that almost 69% variation in dependent variable is described by the independent variables. Puwanenthiren [19] carried out an investigation on capital structure and financial performance in Sri Lanka and found out that capital structure was surrogated by debt while performance was proxy by gross profit, net profit, return on investment or capital employed and return on assets and the overall outcome of the result shown negative relationship between the capital structure and financial performance.

Hossain & Hossain [8] found that managerial ownership positively affect capital structure and other variables like as agency costs, free cash flow to firm, financial costs, non-debt tax shield, profitability, growth rate ,dividend payment and debt service coverage negatively affect the capital structure. And in the study, it also found that in Bangladesh Pecking-order theory and Static Trade-off theory are the most dominant capital structure theories. Shah and Khan [21] conducted their study on non-financial firms listed in Pakistan stock exchange and in these study, they have taken variables like as profitability, size, non-debt tax shield, tangibility and earning volatility which have been considered as important determinants of capital structure and the outcome of the study is that they found size and tangibility have positive relationship with debt ratio and other variables found as insignificant.

Furthermore, Alfawareh et al. [1] did a study on the capital structure of Jordanian non-financial firms. The study framework is made up of variables derived from theories and literature. The independent factors in this study were firm size, asset tangibility, liquidity, profitability, growth potential, and risk, and the dependent variable was leverage. Size, asset tangibility, and profitability were discovered to have a favorable relationship with leverage. Liquidity, growth potential, and IJSB risk, on the other hand, have a negative impact on leverage. A study on a firm's capital structure was conducted by Bab Shah et al. [22] using 480 enterprises from South Asian nations. According to the study, any firm's capital structure may be explained by tangibility, taxation, volatility, profitability, and NDTS. The results showed that Western capital structure models and contemporary finance theories work well for emerging nations in South Asia since they were consistent with assumptions based on the pecking order, agency cost, and static trade-off theories.

3. METHODOLOGY

3.1 Data Description

To conduct the study, Pharmaceutical Industry of Bangladesh has been

selected and data is mainly collected from the secondary source. Data was collected from annual reports of the listed companies from specific website. This study mainly focuses on the listed pharmaceutical companies of Bangladesh. 18 companies from the pharmaceutical industry have been selected based on the availability of data, stability of Performance, availability of data and figures which are operating in Bangladesh from the period of 2012 to 2022.

3.2 Specification of the Model and Measurement Issues

This study is based on the model developed by Dodd and Chowdhury [3,4] to test the determinants of capital structure. According to this model, the capital structure is the function of agency equity, agency debt, bankruptcy, growth rate, profitability and operating leverage.

Capital Structure is determined by the variables shown in below:

CS= f (AE, AD, BR, GR, PR, OL) …… (Equation 1)
Where,
CS=Capital structure
AE= Agency-Equity
AD= Agency- Debt
BR= Bankruptcy Risk
GR= Growth Rate
PR= Profitability
OL= Operating Leverage

Since a model of capital structure is solely based on agency variables would be under specified which means that it should be less than fully specified and other potential determinants of capital structure are included into the theoretical model. The measurement issues and variables are described below. Many of the variables in equation (1) cannot be observed directly. So, proxy variables are needed to test the model. Proxy variables are used following Dodd and Chowdhury [3,4] as below. The reason behind using each of the variables, measurement issues and their expected signs are also described.

3.3. Discussion of the Variables

3.3.1 Dependent Variable

Debt ratio is the dependent variable in this study which is calculated by dividing the book value of total debt of a company by the book value of total claims (debt plus equity) of the company. To calculate the total debt, short term as well as long term debt is used, and book value is used to calculate

equity. In our study, book value is used instead of market value because it has been successfully used in several empirical studies of debt ratios (Titman [24]; Dodd, and Chowdhury [3, 4, and 24]).

3.3.2 Independent Variables

There are six types of independent variables on which the debt ratio is dependent which are the explanatory variables. These independent variables are two types one is Agency Variable and Other Variables.

Agency Equity Cost: In a firm, managers are appointed by the shareholders to do their job as an agent of the shareholders and the main job of the managers is to maximize the value of the firm and it is expected by the shareholders or owners that they will act in the best interest of the firm's owners but it is very often seen that they may deviate from their objectives for fulfilling their duties and responsibilities. So, the costs that arises because of the relationship between managers and shareholders are called agency-equity costs. It is argued that the usage of equity is tended to discourage because of the agency equity cost. Percentage of shares held by the largest shareholders used as a proxy for this variable.

Agency Debt Cost: External financing through debt financing gives rise to agency cost from conflict of interest between shareholders and debt holders because going for external financing may face agency cost as there can be conflict between bondholders and owners. So, agency cost arises due to the conflict of interest between debtholders and shareholders and this cost is likely to discourage the issuance of debt. In this study, the ratio of short-term debt to total debt is used as agency-debt variable because of the difficulty in getting the maturity of debt securities. The relationship is expected to be positive between debt ratio and agency debt cost.

Bankruptcy Cost: The Corporate tax system prefers the firm to introduce more debt capital, and in this way the probabilities of bankruptcy significantly increases since the firm is more likely to default on interest and capital installments. The expected costs of bankruptcy are represented by a measure of the possibility of financial distress in the past studies. Many authors have suggested that firms having higher operating risk may have lower capability of maintaining high debt ratios. Following the prior studies, EBIT coefficient of variation has been used as the proxy variable of bankruptcy risk in this study. This proxy variable has to be negatively related to debt ratio.

Growth Rate: High rates of growth expected to be required more debt ratios because of insufficient additions to retained earnings and similarly lower

growth rate requires less funds. As a result, firms growing at higher rates should have higher ratios than firms growing at lower rates. Jensen and Meckling [10] suggested that growth rate and long-term debt is inversely related to each other. Pecking order theory stated the firm with high growth rate tends to finance from external sources. So, for growing firm the debt ratio is expected to be higher. Sometimes high growth firms lack from internal capital and they need external capital to continue the growth. Thus, the relationship between growth and debt ratio is expected to be positive. The proxy used for this variable is the compounded growth in assets for five years. The relationship expected between debt ratios and growth rate is positive.

Profitability: Profitability is considered as an independent variable under the assumption that debt policy is affected by a company's capability to service debt and fund projects internally with expected cash flows. Highly profitable firms are expected to have higher internally generated funds and a lower reliance on debt. A firm having large amount of internally generated fund for example retained earnings should require less equity financing. Earnings before interests and taxes (EBIT) divided by total assets is considered as a proxy variable. It is expected that there should be a negative relation between the debt ratio and profitability. Dodd and Chowdhury [3, 4] found an inverse relationship between these two variables in their study.

Operating Leverage: Operating leverage is the utilization of fixed costs in the operation of the firm. If a firm has a greater amount of fixed costs and a small amount of variable costs that means the firm has a high degree of operating leverage. On the other hand, if a firm incurs a greater amount of variable costs and a small amount of fixed costs that means the firm has a lower degree of operating leverage. Prior studies have shown that one of the determinants of debt level in a firm's capital structure is 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 negative relationship between operating leverage and debt ratio.

3.3.3 Determination of Dependent & Independent Variables

There are total 7 variables from which one is dependent variable and other six are the independent variable. Debt ratio is considered as the dependent variable which is calculated in book value. The other six variables are the independent variables and their definition and calculation procedure is given in the following table:

Table 01: Variable Definitions.

Serial No.	Indicator	Full Name of the Variable	Definition
1.	DR	Debt Ratio	Ratio of total debt to total financing at book value
2.	AE	Agency Equity	Percentage of shares owned by largest shareholders
3.	AD	Agency Debt	Ratio of short- term debt to total debt
4.	BR	Bankruptcy Risk	EBIT coefficient of variation
5.	GR	Growth Rate	Compounded growth in assets
6.	PR	Profitability Ratio	Ratio of EBIT to total assets
7.	OL	Operating Leverage	Ratio of percentage change in EBIT to percentage change in sales

3.4 Theoretical Expected Signs of Predictor Variables

Based on the four most well-known capital structure theories which are Agency theory, Static Trade-off theory, Pecking-order theory and Signaling theory, the expected theoretical sign of the relationship between independent variables and debt ratio have been derived and demonstrated in the following table:

Table 02: Theoretical Expected Signs.

	Expected Signs			
Independent Variable	Agency Theory	Static Trade-off Theory	Pecking-Order Theory	Signaling Theory
Agency Equity	(-) ve	(-) ve	(+) ve	
Agency Debt	(+) ve			
Bankruptcy Risk	(-) ve	(-) ve	(-) ve	
Growth Rate	(+) ve	(-) ve	(+) ve	(+) ve
Profitability Ratio	(-) ve	(+) ve	(-) ve	(+) ve
Operating Leverage	(-) ve	(-) ve	(-) ve	

4. EMPIRICAL ANALYSIS AND INTERPRETATION OF THE RESULTS

4.1 Descriptive Statistics

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 the table:

Table 03: Descriptive Statistics.

	DR	AE	AD	BR	GR	OL	PR
Mean	0.4243	0.58401	0.5682	0.4790	0.1358	3.3495	0.1573
Median	0.4002	0.5415	0.5644	0.4278	0.1090	0.8813	0.1194
Maximum	0.8611	0.9000	0.9897	1.1490	0.4843	48.6552	0.4791
Minimum	0.0089	0.3536	0.1977	0.1489	0.0035	-6.0770	0.0017
Std. Dev.	0.2476	0.1629	0.2372	0.2577	0.1203	11.6637	0.1239
Sum	7.6379	10.5134	10.2280	8.6229	2.4444	60.2920	2.8325

In table 3, debt ratio has a mean of 0.424 which indicates that about 42.4% of the firms' total assets are financed by debt. The mean of agency equity is about 0.584 which indicates that around 58.4% of the total shares are held by the largest shareholders groups which show that in case of decision making of companies these parties has the highest power. The mean of agency debt is about 0.5682 in the sample which means that approximately 56.8% of total debt is short term debt and mean of bankruptcy risk has found around 0.47905. Growth rate has a mean of .1358 which means that firms on an average growth rate are 13.58% and profitability has a mean of 0.1573 which is satisfactory.

Operating leverage has a mean of 3.3495 which means that for every 1% increase in sales firms operating leverage will increase about 3.35 times. From the table 3, it can be concluded that in pharmaceuticals & Chemicals industry on an average shareholding by large shareholders is around 58%. The short-term debt to total debt ratio is around 57% which shows that short term loan is higher than long term debt. The bankruptcy risk is 0.479055 on an average for this industry. The Growth rate is approximately 14% on an average. The profitability ratio is 16% which is quite good. The operating leverage is 3.35 on an average. The most deviation is found in operating leverage and least deviation is observed in growth rate.

4.2 Correlation Analysis

To test the hypotheses of the study, multiple regression analysis was run to show how the predictor variables explain the capital structure of the firm. Before running the regression model, multi-collinearity problem existence needs to check and here correlation analysis exhibits pairwise correlation of all the independent factors that are included in the model. Table 4 shows the correlation matrix among the independent variable and provides a general idea of the correlation coefficient of the variables.

Table 04: Correlation Matrix.

	AE	AD	BR	GR	PR	OL
AE	1					
AD	-0.2104	1				
BR	-0.1670	-0.0258	1			
GR	-0.2798	-0.1923	0.2237	1		
PR	0.2213	0.2350	0.4775	-0.3579	1	
OL	0.2313	-0.2263	-0.2999	-0.2380	-0.1630	1

Multi-collinearity problem exits when the correlation between two independent variable is .8 or above this. According to Chowdhury [4] 0.50 is a cut off point for coefficient of correlations between two variables as a subjective decision rule to reject null hypothesis. From the table 4, it has been seen that none of the pairwise correlation is more than 0.50 so there is no multi-collinearity problem existence in this study.

4.3 Diagnostics Tests

4.3.1 Augmented Dicky Fuller Test of Unit Root

In this study, we can check whether our data has unit root or not by augmented dicky fuller test. This test can be used with the serial correlation of the data to check the null hypothesis. Hypothesis determination of unit root test:

Table 05: Outcome of the Unit Root Test.

	Null Hypothesis	**: The data has unit root**	
	Alternative Hypothesis	**]: The data is stationary**	

Name of the Variables	P Value	T -Value	Decision
Debt Ratio	0.0014	-4.8821	As P < 5%, Not Unit Root of data
Agency Equity	0.0017	-4.7741	As P < 5%, Not Unit Root of data
Agency Debt	0.0140	-3.7160	As P < 5%, Not Unit Root of data
Bankruptcy Risk	0.0005	-5.4243	As P < 5%, Not Unit Root of data
Growth Rate	0.0027	-4.5600	As P < 5%, Not Unit Root of data
Profitability Ratio	0.0011	-5.0089	As P < 5%, Not Unit Root of data
Operating Leverage	0.0451	-3.1222	As P < 5%, Not Unit Root of data

From the above table it is found that none of the variables have unit root as none of them has at least 5% level of significance which indicates that all the variables that are used in the study are stationary.

4.3.2 VIF (Variance Inflation Factor) Test

Variance inflation factor is a measure of the amount of multicollinearity in an ordinary least squares' regression analysis. If there is a linear relationship or correlation among the independent variables, then there may exists multicollinearity problem because inputs variables are influencing each other and so they are not independent at all. In this study, variance inflation factor has run for multicollinearity to test whether the model is well specified and functioning properly. The severity of any multicollinearity issues can be identified by variance inflation factors. VIF test measures the extent to which an independent variable is influenced by its interaction with the other independent variables. If VIF is greater than 10 then it indicates the presence of multicollinearity problem. The VIF test result for Pharmaceuticals and Chemicals Industry is given in the table 6.

Table 06: Variance Inflation Factors of Pharmaceuticals & Chemicals Industry.

Variable	VIF	1/VIF
PR	2.22	0.4514
BR	1.91	0.5238

GR	1.61	0.6221
AE	1.37	0.7309
AD	1.31	0.7646
OL	1.27	0.7868
Mean VIF	1.61	

The outcome of the VIF test shows that all the independent variables are less than 10 which indicate that there is no multicollinearity problem among the variables of the data set.

4.3.3 Heteroscedasticity Test

When the standard errors of a variable of the regression model monitored over a specific period are non-constant, heteroscedasticity problem occurs. Heteroscedasticity means that there is not constant variance. The model can be substantially affected if there exists heteroscedasticity problem because it can direct wrong calculation of the standard errors in the investigation and similarly the inappropriate decisions about the outcomes. The variability of our regression analysis should be constant to ensure the assumption of linear regression. To test for heteroscedasticity of the model, at first the Breusch-Pagan test which was developed by Breusch-Pagan is used where the null hypothesis for the test says that the sample has constant variance. And if the null hypothesis is rejected then we have heteroscedasticity.

Table 07: The Breusch - Pagan Heteroscedasticity Test.

H_0	Constant Variance
Variables:	fitted values of DR
chi2 (1)	1.03
Prob > chi2	0.3113

From the Table 7, we can see that at 5% level of significance, the chi2 value is not statistically significant and the probability of chi2 is greater than .05 so we fail to reject the null hypothesis. And therefore, there exists no heteroscedasticity problem in the data set. The data set is homoscedastic which says that variances are constant. Halbert White developed another statistical test same as before and that statistical test establishes that variance of the errors in regression model are constant.

Table 08: White Test.

Source	Chi2	df	P
Heteroscedasticity	18.00	17	0.3888
Skewness	2.58	6	0.8592
Kurtosis	0.00	1	0.9896
Total	20.58	24	0.6632

From the table 8, it has been found out that White test result is similar to the Breusch-Pagan test because the outcome of the white test shows that chi2 value of the test is not also significant as the probability of chi2 is greater than .05 and consequently we fail to reject the null hypothesis. So white test shows that there is homoscedasticity in the data set of this study.

4.3.4 Autocorrelation Test

When error terms in a regression analysis correlate over time or are dependent on each other then there may exist autocorrelation problem. If correlation exists in the data set of this study and correlate with each other then it violates the assumption of OLS estimator. And therefore, autocorrelation test is important to do to apply corrective measures if it exists. In this study Breusch Godfrey serial correlation LM test is used to for autocorrelation test. The hypothesis in this case is:

Null hypothesis: There is no serial correlation

Alternative Hypothesis: There is a serial correlation.

Obtained chi-square for this model is 0.1354 which indicates that chi2 is greater than 0.05 or 5% so we fail to reject the null hypothesis. In other words, there is no serial correlation between the residuals in the model.

4.4 Model Summary

In this part, we would discuss about the summary of the model of Pharmaceuticals & Chemicals industry data. The model summary of the Pharmaceuticals & Chemicals industry data is shown in the following table:

Table 09: Model Summary of Pharmaceuticals & Chemicals Industry.

R Square	Adjusted R Square	Standard Error Estimate	F Statistics
0.5896	0.3658	0.1971	2.6348

In the table 9, the model summary shows that R square of the model is 58.96% which is quite good which means that almost 58.96% of the variation in the debt ratio can be explained by the independent variable. This indicates good explaining power of the model. The adjusted R square is 36.59%. So, the adjusted explanatory power of the model is 36.59%. The F statistics value is 2.63 which represents overall significance level of the model. Here the F value shows that there is a linear relationship between dependent and each independent variable. So overall the model is quite good.

4.5 Result of the Regression Model

Table 10: Regression Results.

Independent Variable	Estimated Coefficients	Standard Error	p value	t Statistic
Intercept	-0.1667	0.3107	0.6021	-0.5364
Agency Equity	0.9188	0.3431	0.0215	2.6775*
Agency Debt	0.1318	0.2305	0.5787	0.5721
Bankruptcy	0.4751	0.2314	0.0646	2.0533*
Growth Rate	-0.3148	0.5040	0.5449	-0.6247
Profitability	-1.3219	0.4636	0.0158	-2.8512*
Operating Leverage	0.0054	0.0046	0.2679	1.1670
R^2 .589				
Adjusted^2 .365				
F Statistics 2.634				

* Significant at the 5% level.

The result of the regression analysis is explained in this section. The overall fit to the model was discussed in the earlier section. Based on the significance level of the variables and based on the expected and observed coefficient signs of the variables, the result of the regression model is described in this part. The regression result of the determinants of Pharmaceuticals and Chemicals industry is given in table 10.

Table 4.10 shows the coefficient and the t value of each determinant of capital structure along with the indication that whether the variable is significant and whether the observed coefficient sign is similar to the expected sign of the variables.

Table 11: Regression Analysis of Pharmaceuticals & Chemicals Industry.

Variables	Coefficient	P value	Significance	Coefficient Sign
AE	0.9188	0.0215	√	×
AD	0.1318	0.5787	×	√
BR	0.4751	0.0646	√	×
GR	-0.3148	0.5449	×	×
PR	-1.3219	0.0158	√	√
OL	0.0054	0.2679	×	×

There is significant relationship of capital structure with three variables which are agency equity, bankruptcy risk and profitability.

Table 4.11 shows that agency equity, agency debt, bankruptcy risk, operating leverage are positively related with the leverage where agency theory expects agency equity, operating leverage and bankruptcy should negatively related with the leverage. On the other hand, other two determinants are negatively related with the debt ratio. And according to the agency theory, the matched signs are two and other four are unmatched. Agency equity, Bankruptcy Risk, growth rate and operating leverage have different coefficient signs than the expected ones. Agency Debt, Profitability Ratio have similar coefficient signs which is expected in the agency theory.

Table 12: Expected and Observed Sign of Coefficients.

Independent Variable	Expected Signs				Observed Signs
	Agency Theory	Static Trade-off Theory	Pecking-Order Theory	Signaling Theory	
Agency Equity	(-) ve	(-) ve	(+) ve		(+) ve
Agency Debt	(+) ve				(+) ve
Bankruptcy Risk	(-) ve	(-) ve	(-) ve		(+) ve

Growth Rate	(+) ve	(-) ve	(+) ve	(+) ve	(-) ve
Profitability	(-) ve	(+) ve	(-) ve	(+) ve	(-) ve
Ratio					
Operating	(-) ve	(-) ve	(-) ve		(+) ve
Leverage					

5. DRUG RECOMMENDATIONS

Examine the regulatory environment and policy changes in Bangladesh that might impact the capital structure decisions of pharmaceutical and chemical companies. Changes in tax regulations, government incentives, and trade policies can significantly affect financing choices. Compare the capital structure factors of pharmaceutical and chemical companies in Bangladesh with those in other countries or regions. This comparative analysis can help identify unique factors that might be driving capital structure decisions in Bangladesh. Interview industry experts, executives, and professionals from the pharmaceutical and chemical sector to gain qualitative insights into the specific factors that influence capital structure decisions in Bangladesh's context. This can provide a more holistic understanding.

6. CONCLUSIONS

Determination of optimum capital structure is one of most important and crucial task for firm managers. Firm may face financial distress if the capital structure of the firm is not optimum. Many theories of capital structure have been developed in order to facilitate firms determining the optimal capital structure as it is the most analyzed topic all over the world. It always deals with the tradeoff between equity and debt and to find out the less costly but more beneficial one so that firm’s value may increase. If the debt to equity mixture is improper, the value of the firm may decrease and similarly firm may lose its stability. Moreover, having too much debt may cause the firm to become bankrupt. As a result, an optimum mixture of the debt and equity is one of the most crucial questions for a firm to solve.

This study attempts to analyze the recent capital structure pattern of Bangladeshi business firms and compare the result with the previously analyzed data. As the study was done to find out the determinants of capital structure, so a regression analysis was conducted using data of listed companies of Pharmaceuticals and Chemicals Industry. The result found from the regression analysis was to some extent similar to the result found in the previous studies. The variable agency debt of capital structure followed the

agency theory though the variable is insignificant. On the other hand, agency equity and bankruptcy risk found to be significant in this model but having opposite sign compared to the agency theory. Finally, future study on capital structure determinants may be extended and may serve as a new concern to have further research on Bangladeshi firm-capital structure impacts on firm performance, profitability and expected growth.

REFERENCES

[1] Alfawareh, F. S., Al-Kofahi, M., Daoud, L., Marei, A., & Alkhazaleh, A. (2021). The Determinants of Capital Structure: A Conceptual Understanding of Non-Financial Firms in Jordan. Turkish Online Journal of Qualitative Inquiry, 12, 2144-52.

[2] Baker, M. and Wurgler, J. (2002). Market Timing and Capital Structure. *The Journal of Finance*, 57 (1), 1-32.

[3] Chowdhury, M. (2000). Agency Costs and Capital Structure: Theory and Evidence. *Finance and Banking, University of Dhaka*, 5 (1 & 2), 24-39.

[4] Chowdhury, M. (2004). Capital Structure Determinants: Evidence from Japan & Bangladesh. *Journal of Business Studies*, 25 (1), 17-55.

[5] DeAngelo, H., and Masulis, R. W. (1980). Optimal Capital Structure under Corporate and Personal Taxation. *Journal of Financial Economics*, 8 (1), 3-30.

[6] Frank, M., & Goyal, V. K. (2009). Capital Structure Decisions: Which Factors are Reliably Important? *Financial Management*, 38 (1), 1–37.

[7] Haque, Z. (1989). Capital Structure Patterns; A survey of Companies Listed on the Dhaka Stock Exchange Limited. *The University grants Commission of Bangladesh, Dhaka*.

[8] Hossain, M. (2015). Effects of Capital Structure and Managerial Ownership on Profitability: Experience from Bangladesh. *International Journal of Business and Management*, 11 (9), 218-229.

[9] Huang, S. and Song, F. (2002). The Determinants of Capital Structure: Evidence from China. *SSRN Electronic Journal*.

[10] Jensen, M. C., & Meckling, W. H. (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. *Journal of Financial Economics*, 3 (4), 305-360.

[11] Kraus, A., & Litzenberger, R.H. (1973). A State-Preference Model of Optimal Financial Leverage. *Journal of Finance*, 911–922.

[12] Lima, M. (2009). An Insight into the Capital Structure Determinants of the Pharmaceutical Companies in Bangladesh. In *GBMF Conference*.

[13] Luigi, P. and Sorin, V. (2009). A Review of the Capital Structure Theories. *Annals of Faculty of Economics*, 3 (1), 315-320.

[14] Miller, M., & Modigliani, F. (1961). Dividend Policy, Growth, and the Valuation of Shares. *The Journal of Business*, 34 (4), 411-433.

[15] Modigliani, F., & Miller, H. M. (1959). The Cost of Capital, Corporation Finance, and the Theory of Investment: Reply. *The American Economic Review*, 49 (4), 655-669.

[16] Mostafa, H. and Boregowda, S. (2014). A Brief Review of Capital Structure Theories. *Research Journal of Recent Sciences*, 3 (10), 113-118.

[17] Mustafa, M.S. and Osama, S.H (2012) 'Capital Structure and Corporate Performance Empirical Study on The Public Jordanian Shareholdings Firms Listed in The Amman Stock Market'. *European Scientific Journal,* 22 (8), 173-189.

[18] Myers, S. C. (2001). Capital Structure. *The Journal of Economic Perspectives*, 15 (2), 81-102.

[19] Puwanenthiren, P. (2011) 'Capital Structure and Financial Performance: Evidence From Selected Business Companies In Colombo Stock Exchange Sri Lanka. *Journal of Arts, Science & Commerce,* 2 (2), 171-183.

[20] Ross, S. (1977). The Determination of Financial Structure: The Incentive-Signalling Approach. *The Bell Journal of Economics*, 8 (1), 23-40.

[21] Shah, A. and Khan, S. (2007). Determinants of Capital Structure: Evidence from Pakistani Panel Data. *International Review of Business Research Papers*, 3 (4), 265-282.

[22] Shah, B., Gujjar, M. A., & Tunio, G. (2022). Determinants of Capital Structure: Evidence from South Asian Emerging Economics. Journal of Quantitative Finance and Economics, 4 (1), 39-64.

[23] Smith, C. and Warner, J. (1979). On Financial Contracting. *Journal of Financial Economics*, 7 (2), 117-161.

[24] Titman, S., & Wessels, R. (1988). The Determinants of Capital Structure Choice. *The Journal of Finance*, 43 (1), 1-19.