

LEVERAGE, RISK, AND PROFITABILITY: EMPIRICAL EVIDENCE FROM SELECTED MANUFACTURING SECTORS OF BANGLADESH

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ABSTRACT

Corporate capitalization and use of leverage have been of great interests in academic researches on corporate finance. Theory suggests that leverage benefits a company in twofold: debt is less expensive than the counterpart equity capital and it provides tax shield from the tax deductibility on financial charge payments. Due to these two saving windows, leverage has a potential to increase the return on equity of common shareholders. However, since usage of leverage burdens a company with mandatory financial charge payments, it increases financial risk of the company that may provoke a potential failure. The researchers have tried to find out the relationship among leverage, risk, and profitability. The study further looks into the theoretical relationship among the variables and determines the factors having most impacts on these three aspects. The study involves data from 24 manufacturing companies listed in Dhaka Stock Exchange (DSE) of five manufacturing industries for the period of 2007-2014. The Least Squares Regression has been applied on three equations derived for the theoretical modelling. The study suggests that firms with lower profitability are highly riskier, as deemed by the investors due to the higher variations in profit generation, use higher leverage than the amount they could hold otherwise and experience a decrease in profits due to increasingly high marginal cost of capital charged by the investors due to an increase in their perceived risk and the premium to justify the risk intake. The high growth companies use more debts, generate more profits, and usually are more risky. The larger firms have higher amount of debt with lower profits. The highly capital intensive firms hold lower leverage with higher profitability and higher risk. The firms with higher fixed cost in its cost structure hold more leverage and result lower profit but usually are risky. The older firms have lower leverage whereas liquid firms have higher debts.

Keywords: Capital Structure, Leverage, Debt Ratio, Risk, Profitability, Returns, ROE, Manufacturing Sectors, Least Squares Regression.

INTRODUCTION

Financial managers' duties primarily entail choosing the best corporate capital structure for a company by adequately weighing positive and negative impacts of its components. In deciding the optimal mixture of

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equity and debt in a firm's capital structure, financial managers' key motivation is maximizing the shareholders wealth. The substitution of equity capital by lower cost long-term debt theoretically can raise a firm's value. Theory suggests that increasing a company's debt up to a certain extent, the optimal level, increases the value of the company primarily because of two reasons: equity is usually more costly than debt and tax deductibility on debt's financial charges (i.e., interest payments) commonly known as tax shield. The allocation of risk among different groups of stakeholders of a corporation is also an end goal of corporate finance. Therefore there has been an esoteric debate over the significance of a firm's choice of capital structure from the publication of the very first research on this topic by Modigliani & Miller (1958).

There have been numerous studies performed on the determinants of leverage with a kick off in 1960's in the US. Bangladesh also experienced some researches in this topic arena. So far there is an inadequacy of researches done for understanding the relationship among risk, profitability, and leverage. Theoretically increment of leverage enhances profitability of a firm along with increasing risk of failure of the company, a high financial risk, because it burdens with a fixed obligation to the firm (Hurdle, 1974). In addition, theory says a firm should earn a higher return on its equity when it has a greater proportion of debt in its capital structure and this higher return on equity should translate more rapid growth of earnings (Murphy, 1968). In this paper the researchers tried to estimate relationship of risk and the opportunity to earn higher return on equity due to the capitalization components of the companies under selected manufacturing sectors of Bangladesh.

OBJECTIVE

This paper aims at analysing and measuring the relationships among leverage, risk, and profitability. The study assumes that a profitable firm uses less leverage and a risky firm uses more leverage, however, a profitable firm tends to be risky due to variability inherent in its profitability. The study further focuses on testing theoretical models

using time series data to judge significance of factors relating to leverage, profitability, and risk of a firm.

LITERATURE REVIEW

Modigliani & Miller (1958) stated that the market value of a company is not affected by the capital structure of the company. It implies that managers cannot create value simply by changing the company's capital structure because adding leverage increases the risk exposure of equity holders which justifies seeking compensation for bearing additional risk. Essentially the fixed interest payment obligation increases the risk of default (Hurdle, 1974).

Profit variability for risk is projected to have positive correlation with rate of return on equity (Hurdle, 1974). Hall & Weiss (1967) stated that some firms with command on variance of profit are willing to give up some fraction of potential earnings.

Murphy (1968) argued that leverage (calculated as long-term debt to total capitalization) is unrelated to the ROE as heavy leverage didn't tend to project higher rate of returns on equity. He further asserted that when leverage is unrelated to the relative growth and profitability of a company, it may also have no relation with variance of profitability and price of the company in the market place (Murphy, 1968). Baker (1973) referenced two cross-section studies those have yielded that firms with low leverage earned higher rate of returns on equity. Considering works of Hall & Weiss (1967), it was hypothesized that profitability and leverage may affect each other meaning profitability and leverage both have predictability over each other (Baker, 1973).

In a study, it was found that equity asset ratio had a significant positive effect on returns on equity keeping market structure variable constant and asserted that "*relatively profitable firms take some of the exceptional returns in the form of reduced risks*" (Hall & Weiss, 1967).

It is expected that there is negative correlation between risk and debt (Hurdle, 1974). Hall&Weiss (1967) stated that without raising more debt and the resultant risk, firm can sustain a higher than average profits with lower variance but different data have been found to trigger different results. On other hand, high capitalization, the resultant of high debt, associates lower risk (Hurdle, 1974). Hurdle (1974) argued with certainty that *“high profits are necessary in order to have a choice in capital structure, which could imply a positive coefficient would associate high profits with high risk”*.

He further stated that fast growing firms usually have higher leverage than slowly growing firms. Lower profit variance is expected to be associated with size as size implies diffusion of risks and high asset turnover is aligned with capital intensive firms. On the other hand, large fixed costs make firm thriving for the stability of profit on the cautions of failure to meet these obligations (Hurdle, 1974).

Empirical study implies that firms with higher profit tend to have large fluctuations in profit and higher profit deviation requires assurance of higher profitability before holding higher debt (Hurdle, 1974). Study of Mazur (2007) concerning a group of Warsaw Stock Exchange listed companies (2000-2004) indicate that enterprises with higher profitability and liquidity prefer internal sources of financing. Firms in a similar industry are likely to have similar amount of leverage because industry condition have significant impact on firm's selection of holding leverage due to the implied financial risk choice that is influenced by demand and cost risks (Baker, 1973). In view of the cost fixity equation of Sherman&Tollison (1972), Baker(1973) described that *“...ceteris paribus, larger amounts of cost fixity imply higher profit rates. Also, firms with relatively high cost fixity and corresponding potentially high profit risk may, ceteris paribus, tend to choose financial structures that are relatively less risky...”* It is also expected that lower profit risk dictates taking more leverage and cost fixity affects both leverage and profitability of a company (Baker, 1973). He found out that on a relative basis, more leverage results higher profitability and in turn greater risk.

METHODOLOGY

The study has tried to find out the relationship among leverage, risk, and profitability and further looks into the theoretical relationship among the variables and determines the factors having most impacts on these three aspects. In this regard, a descriptive research design has been followed.

Data sources and sample size

To conduct this study, secondary data from financial statements of 24 manufacturing companies of five manufacturing industries; out of 88 companies under these 5 manufacturing industries listed in Dhaka Stock Exchange (DSE) were collected. These industries are namely pharmaceuticals (pharma), chemicals (chem), Cement (cem), Food and Allied (F&A), and Engineering (Eng). The selection of sample size was based on the best data availability in the manufacturing sectors listed in DSE. The time period under the research interest is 2007 to 2014 due to the data availability of all selected firms. Number of companies in the sample is 24 including nine (9) from pharmaceuticals, five (5) from chemicals, five (5) from cement, two (2) from food and allied, and three (3) from engineering industries respectively. Appendix-1 shows the name of the selected companies from each selected industries used in this study.

Measurement of the variables and analysing tools

From various empirical studies on capital structure and leverage (Hurdle, 1974; Hall & Weiss, 1967; Murphy, 1968; Baker, 1973; Mira, 2005; Scherer, 1970; Akhtar, 2005; Mazur, 2007; Sayeed, 2011; Siddiqui, 2012), the researchers have come up with variables those have been stated as having strong explanatory power on risk, profitability, and leverage of any firms.

Least Squares Regression was run to determine the impact of independent variables, the explanatory variables, on dependent variables. As the title of this research suggests, the study utilized three regression

models to compute impacts on profitability, risk, and leverage respectively. The three regression models and their elements are:

$$L = \alpha + \beta_1 \text{Growth} + \beta_2 \text{Size} + \beta_3 P + \beta_4 \sigma \text{profit} + \beta_5 \text{AT} + \beta_6 \text{CF} + \beta_7 \text{Age} + \beta_8 \text{LE} + \beta_9 \text{LR} + \beta_{10} \text{OL} \dots\dots\dots (I)$$

$$P = \alpha + \beta_1 \text{Growth} + \beta_2 \text{Size} + \beta_3 L + \beta_4 \sigma \text{profit} + \beta_5 \text{AT} + \beta_6 \text{CF} + \beta_7 \text{Age} + \beta_8 \text{LR} + \beta_9 \text{OL} \dots\dots\dots (II)$$

$$\sigma \text{profit} = \alpha + \beta_1 \text{Growth} + \beta_2 \text{Size} + \beta_3 P + \beta_4 \text{AT} + \beta_5 L + \beta_6 \text{CF} + \beta_7 \text{Age} + \beta_8 \text{LE} + \beta_9 \text{OL} + \beta_{10} \text{LR} \dots\dots\dots (III)$$

Where,

L= As proxy for leverage, total debt ratio has been used and calculated as sum of debt in current liabilities and long-term liabilities as the ratio to sum of the debt and equity combined.

P= Calculated as the net income available to common equity holders to total equity, otherwise usually referred as return on equity (ROE).

□profit= The average absolute deviation in annual profits calculated on the ROE calculated previously as P.

Growth= Calculated as the growth in sales over the previous year's sales i.e., $\left(\frac{\text{Revenue}_t - \text{Revenue}_{t-1}}{\text{Revenue}_{t-1}}\right)$.

Size= Size of a firm has been calculated as the natural logarithm of total assets of the company.

AT= Asset turnover of a firm is calculated as the ratio of total assets to revenues.

CF= Cost fixity calculated as $\left(1 - \frac{\text{Variable Expense}}{\text{Total Variable and Fixed Expense}}\right)$.

Age= Natural logarithm of years firm has been in operation.

EL= Long-term debt to Earnings before Interest, Taxes, Depreciation, and Amortization (EBITDA) has been calculated to measure firm's ability to repay its debt outstanding in an appropriate manner.

LR= Liquidity ratio is calculated as total current assets over total current liabilities.

OL= Operating leverage as calculated Earnings before Interest, and Taxes (EBIT) over revenue.

α = Intercepts of the models.

β_i = Coefficients of independent variables.

Equation (I), (II), and (III) represent leverage, risk, and profitability regression models to be estimated in the analysis.

Expected Findings

The expected findings from the empirical analysis are as follows:

More profitable firms have comfort to use internally generated funds for its funding requirements compared to low profitable firms. This is also true for the firms those are in business operations for many years as these firms can rely on internally generated funds as it grows older. Firms with higher liquidity should prefer using internally generated funds over issuance of new debt for its financing needs. These three situations imply higher profitability with lower variance. On the other hand, effect of asset turnover is sought to have positive relationship with leverage and risk due to the efficiency resultant from the proficient use of a firm's assets and stable profits over time with potential engagement in price cutting (Scherer, 1970). However, firms with more principal payment of debt outstanding should prefer to use internally generated funds in order to avoid failure risk, a resultant from inability to pay down debt sufficiently. Thus, this condition reduces profit variance accordingly. Firms those are growing rapidly are sought to have higher debt because funds generated internally are not sufficient to fuel their immense growth opportunities and consequently raise firm's profitability

with significant variance. However, firms with higher operating leverage implies higher cost structure risk that makes Earnings before Interest and Taxes (EBIT) vulnerable and thus reducing profit available to the common equity holders of the company. Firms utilizing higher operating leverage should employ less debt in its capitalization to avoid incurring more mandatory fixed payments thus reducing variation in profit available for common equity holders. On the other hand, cost fixity implies cost structure risk of a company and potentially discouraging inclusion of more financial risk in terms of leverage but increases profitability of the company with reducing variance over time (Baker, 1973).

Theoretical impact of variables

Based on the literature study, the study has derived the theoretical expected relationships of the independent variables with the leverage equation, profitability equation and risk equation which are shown in Table 1, Table 2 and Table 3 respectively.

Table 01: Variable and Their Impacts in Leverage Equation

Equation I		
	Variables	Impact
Dependent Variable	L	
Independent Variable	P	Positive/Negative
	□profit	Negative
	Growth	Positive
	Size	Positive
	AT	Positive
	CF	Negative
	Age	Negative
	LE	Negative
	LR	Negative
	OL	Negative

Table 02: Variable and Their Impacts in Profitability Equation

Equation II		
	Variables	Impact
Dependent Variable	P	
Independent Variable	L	Positive/Negative
	□profit	Positive/Negative
	Growth	Positive
	Size	Positive/Negative
	AT	Positive
	CF	Positive
	Age	Positive
	OL	Positive/Negative
	LR	Positive

Table 03: Variable and Their Impacts in Risk Equation

Equation III		
	Variables	Impact
Dependent Variable	□profit	
Independent Variable	L	Negative
	P	Positive/Negative
	Growth	Positive
	Size	Negative
	AT	Positive
	CF	Negative
	Age	Negative
	LE	Positive
	OL	Positive
LR	Negative	

ANALYSIS AND FINDINGS

The least square regression method has been applied on these three equations. The result of the analysis is as follows with t-statistics in the parentheses:

Equation I: Leverage

As expected, highly growing firms use more debt in the manufacturing sectors to boost their profitability in positive net present value projects than corresponding slowly growing firms or dying firms. On the other hand, large companies, as determined by size variable, use more debt in

their capital structure. It's conflicting with the findings of Hurdle (1974) that large companies in terms of both size and market share are negatively related with leverage. The possible explanation of this result lies behind the fact that the larger a firm, the higher collateral is available to support intake of debt. Therefore, larger firms use higher leverage.

The negative relation of profitability to leverage indicates that increased costs of debt decrease the profits available to shareholders, therefore higher profits are necessary in order to enjoy different choices of capital structure components. The measure of risk found to be positively related with leverage and supported by the practical scenario in Bangladeshi market. The larger firms have more collateral available to draw debts from banks and financial institutions and therefore they use more and more leverage to increase profits. However, the profits come with higher variability due to increased marginal cost of leverage.

$$L = 0.34 + 0.066\text{Growth}^* + 0.005\text{Size} - 0.014\text{P} + 0.068\text{profit}^* - 0.0782\text{AT}^{***}$$

$$(1.34) \quad (2.07) \quad (0.38) \quad (0.98) \quad (2.19) \quad (-6.86)$$

$$+ 0.027\text{CF} - 0.074\text{Age}^* + 0.077\text{LE}^{***} + 0.019\text{LR}^* - 0.228\text{OL}^*$$

$$(0.25) \quad (-2.00) \quad (10.45) \quad (2.57) \quad (-1.97)$$

t statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

$$R^2 = 0.37$$

$$\text{p-value} = 0.00$$

Firms with higher asset turnover are found to use less debt in their capitalization to exploit the scale economies in production. On the other hand, firms having more fixed expenses in its cost structure use more debt and thus increase overall risk of the firm by increasing idiosyncratic risk along with the financial risk.

As firms get older, the corporate managers usually seek to use internally generated funds over debt financing. The negative relationship found in the leverage equation indicates that aged firms under the study have generated enough fund internally to fund its capital budget or use of internally generated funds are less expensive than the debt financing

available in the market. Firms with higher long-term debt to EBITDA are found to use more debt in addition to its existing debt burden.

On the other hand, higher liquidity ratio is positively related with leverage as firms constrained with leverage limits require them to decrease the liquidity buffers by dipping the cash and other highly liquid assets they hold and thereby making them riskier as a result. The relationship of operating leverage and leverage has been found significantly negative as firms with higher fixed expense avoid incurring more fixed payment obligations to have a minimized overall risk.

The leverage equation has been found statistically significant as 37% of variability in the dependent variable, the leverage, is explained by the model with a p-value 0.00 (significantly <0.05).

Equation II: Profitability

The negative relation between leverage and profitability(as measured by return on equity) indicates that firms with higher leverage usually have lower return on its equity capital due to increase marginal cost of capital, ceteris paribus. This notion entertains that as long as firms can enjoy higher tax shield from tax deductibility of its mandatory debt expense with lower marginal cost of capital can raise its return on equity. This also justifies the higher marginal tax rate and higher marginal cost of capital for companies in Bangladesh.

The risk has also been found to be positively related with profitability as firms with higher profits usually have larger variation in its profit and hold more leverage; firms need to ensure higher profit as explained in the leverage equation (Hurdle, 1974).

$$\begin{array}{rcccccc}
 P = & 8.239^{***} & -0.255\text{Growth} & -0.579\text{Size}^{***} & -0.646L & +0.917\text{profit}^{***} & +0.051AT \\
 & (5.07) & (-1.65) & (-5.57) & (-1.90) & (4.82) & (1.01) \\
 & & -0.067CF & +1.227\text{Age}^{**} & -0.012LR & +1.567OL^{**} & \\
 & & (-0.11) & (3.07) & (-0.37) & (2.70) &
 \end{array}$$

t statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

$$R^2 = 0.38$$

$$p\text{-value} = 0.00$$

The size variable is negatively related with profitability implying that larger firms have lower profits and this finding doesn't comply with the findings of Hurdle (1974) and Hall & Weiss (1967). The possible explanation entails that larger firms in Bangladesh usually hold high level of leverage and thus increased marginal cost of capital and lower profits available to the shareholders. The positive relationship of growth with profitability connotes that highly growing firms generate more profits compared to slowly growing or dying companies.

The asset turnover tends to reflect expectation of positive relationship with profitability suggests that the relationship between economies of scale and profitability is positive. The negative relationship with cost fixity infers that firms under the study have lower fixed expenses relative to variable expenses they incur. Therefore their contributions to profitability get reduced by the increasing marginal costs.

The older firms have been found to generate more profits than their younger counterparts and the firms with higher liquidity also have positive relationship with profitability of the companies. The positive relationship between operating leverage and profit implies cost structure risk of the firms. The profitability equation has also been found statistically significant as 38% of variability in the dependent variable, the return on equity, is explained by the model with a p-value 0.00 (significantly <0.05).

Equation III: Risk

The significant positive relationship between risk and profitability implies that firms with higher profitability are deemed as risky by the investors due to the higher profit firms usually have larger variations in their profit generation as described in profitability equation. Similar to the relationship found in the leverage equation, risk equation also suggests the positive relationship between leverage and risk due to the fact that in quest of higher returns firms draw leverage and as a result experience higher variations in profitability due to increased cost of debt

by swelling investors expectation for higher risk premium, an increase in the marginal cost of debt capital, and thus increases total risk of the firm.

$$\square \text{profit} = 1.715^{**} + 0.181\text{Growth}^{***} - 0.118\text{Size}^{**} + 0.094\text{P}^{***} + 0.123\text{AT}^{***} + 0.256\text{L}^* \\ (2.94) \quad (3.60) \quad (-3.11) \quad (3.98) \quad (5.68) \quad (2.01) \\ + 0.022\text{CF} \quad + 0.275\text{Age}^* - 0.086\text{LE}^{***} + 0.170\text{OL} \quad - 0.019\text{LR} \\ (0.11) \quad (2.01) \quad (-6.24) \quad (0.54) \quad (-1.62)$$

t statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

$$R^2 = 0.38$$

$$\text{p-value} = 0.00$$

Highly growing firms are found to have lower variability in their profitability over their slowly growing or dying counterparts implying that growing firms face limited market structure barriers (further researches are warranted to ascertain the impact of this variable on risk) and have stable growth rate over time. The positive relationship of asset turnover with risk of a firm signifies that capital intensive firms, the firms with high asset turnover, are more likely to engage in price cutting and comply with the findings of Scherer (1970).

The larger firms are found to have lower variability in their profit generation as they have a higher control power over the production and the sales of their produces in Bangladesh (further researches are required for this variable and its associated market and production factors). The older firms seem to have more variability in their profitability though they acquired significant business experience however, the increased marginal cost capital increases variability of return.

There is positive relationship between cost fixity and variability in profit generation as explained in profitability equation that firms holding higher fixed expenses can stabilize the profitability because of lower marginal costs however; firms under the study tend to have lower fixed expenses. Firms with higher operating leverage have positive relationship because higher operating leverage suggests more cost structure risk and boost up the variability in earnings before interest and taxes (EBIT) of a company.

The companies with higher liquidity ratio have lower variability in their profitability due to the home made funds available for its immediate needs. On the other hand, the long-term debt to EBITDA variable is significantly negatively related with risk.

The risk equation has also been found statistically significant as 38% of variability in the dependent variable, the return on equity, is explained by the model with a p-value 0.00 (significantly <0.05).

CONCLUSION

The study establishes the theoretical relationships among leverage, profitability and risk in the perspective of manufacturing industries in Bangladesh. It is empirically established that the profitable firms use less leverage whereas the risky firms use more leverage, *ceteris paribus*. However, a profitable firm tends to be risky due to variability inherent in its profitability. The study suggests that firms with higher profitability are highly riskier in consequence, as deemed by the investors due to the higher variations in profit generation, use lower leverage than the amount they could hold otherwise to avoid increasingly high marginal cost of capital charged by the investors because of an increase in their perceived risk and the premium to justify the risk intake.

The high growth companies are found to use more debt and consequently generating more profits with more variations than their slowly growing or dying counterparts. This relationship implies that growing firms face more market structure barriers and have unstable growth rate over time. The larger firms use higher debt in its capitalization as they have substantial collateral to intake more debts and as a result can comply with their preference of lower risk and higher debt to lower profits. It implies that a firm can continue generating higher profits with lower deviations, lower risk as a resultant, while holding higher amount of debt. The firms with high asset turnover seem to hold lower debt in their capitalization with higher profitability and higher variations. It implies that highly capital intensive firms are more likely to

avoid debts to avoid increased marginal cost of capital but do not engage in price cutting. The firms having higher fixed expense in their cost structure tend to hold higher debt but lower profit with higher variations though fixed expenses are supposed to stabilize profit variations but increase total risk of a firm by increasing cost structure risk of that company.

The older firms are found to hold lower leverage and generate higher profit and lower variations connoting their scale economies from learning curve. On the other hand, firms with higher long-term debt to EBITDA are found to use more leverage and negating the profit variations (more evidence is required to conclude on this variable).

The firms with more liquidity use unexpectedly higher debt but experience decrease in profitability with lower variance suggesting that firms 'intake of leverage tends to cost higher and therefore decrease returns. On the other hand, the higher cost structure risk as measured by higher operating leverage increases profit variations and return on equity for common equity holder. It further reduces the comfort of using leverage as to avoid increasing total risk of the company.

Further researches concerning leverage, risk, and profitability of any company should include different market and industry variables such as market share, concentration ratio, demand variability of firms' produces etc. and other production variable such as production variability etc. to ascertain the relationship among risk, profitability, and the use of leverage in a firm's capital structure.

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APPENDIX-1

List of sample companies:

Industry	Company
Pharmaceuticals (pharma)	1. ACI Limited
	2. BeximcoPharma
	3. GlaxosmithKline
	4. The IbnSina
	5. Libra Infusions Limited
	6. Orion Infusion Ltd.
	7. Renata Ltd.
	8. Square Pharmaceuticals Ltd.
	9. Pharma Aids
Chemicals (chem)	1. Keya Cosmetics
	2. Kohinoor Chemicals
	3. Reckitt Benckiser(Bd.)Ltd.
	4. ACI Formulations Limited
	5. Beximco Synthetics
Cement (cem)	1. Confidence Cement
	2. Heidelberg Cement Bd.
	3. Aramit Cement
	4. Lafarge Surma Cement Ltd
	5. Meghna Cement Mills Ltd
Food and Allied (F&A)	1. AMCL (Pran)
	2. British AmericanTobaco BD Co.
Engineering (eng)	1. Aftab Automobiles Limited
	2. National Polymer Bangladesh Limited
	3. Singer Bangladesh Limited