

Unveiling The Relationship Between Capital Structure and Firm Performance

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DOI : 10.23862/kiit-parikalpana/2024/v20/i2/226725

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Declaration: This is an original work, and is not submitted elsewhere or under consideration for review. All the authors contributed equally to the development of this manuscript.

Declaration of interest statement: The author(s) declare no conflict of interest.

Funding: This research received no external funding.

Abstract

The study explores the intricate link between capital structure and firm performance. Existing research on the relationship between financial leverage and company results has mostly examined linear relationships; however, this study takes a fresh approach by investigating possible non-linearity as well in the capital structure–firm performance relationship. The paper uses sophisticated econometric approaches to estimate and analyze the potential non-linear dynamics between capital structure decisions and profitability measures, drawing on a dataset of BSE 100 companies. The panel regression on the data period from 2014 to 2023 shows that although the linear model shows a positive effect of the debt-equity ratio, the quadratic regression model finds no significant effect of the debt-equity ratio and its quadratic term on ROA. The research findings add to the body of literature and provide insight into the best capital arrangements for businesses.

Keywords: *Capital Structure, Performance, Non-linearity, Non-financial Companies, Return on Asset*

JEL Classification: *G32, L25*

1. Introduction

Capital structure is often regarded as the most important aspect determining a company's capital market orientation and success. To maximize shareholder wealth, finance managers work to determine the best capital

structure, which calls for a variety of funding sources for varied projects (Bakhshani, 2017). This endeavor might result in changes to a firm's capital structure that combines the proportions of debt and equity (Gord et al., 2015). Consequently, the capital structure serves as a significant input with far-reaching

implications for businesses, impacting financial ratios (such as return on assets and return on equity), cost of capital, and risk. Businesses with higher debt levels may have better returns on assets (ROA), but this also increases financial risk for the company, which affects the cost of capital and has a cyclical effect. Even though firms choose debt over equity since it is less expensive, it is important to take into account the simultaneous influence on financial riskiness. As a result, concerns about bankruptcy and financial hardship are related. Finding the ideal debt-to-equity ratio becomes crucial for determining how well a company performs financially (Nirajini & Priya, 2013; Mohammad & Bujang, 2020).

The influence of capital structure on the profitability of firms is still a subject of debate among financial specialists. The Irrelevance Theory of Modigliani and Miller (1958), which maintained that capital structure does not affect company value in an ideal capital market free from taxes, information asymmetry, transaction costs, and bankruptcy costs, is the cornerstone of contemporary corporate finance. Since then, several ideas have attempted to determine the best debt-to-equity ratio for businesses. The Trade-Off Theory developed by Kraus and Litzenberger (1973) emphasizes the need for businesses to weigh the benefits and risks of debt financing, taking into account the trade-off between tax advantages and the expenses associated with financial hardship. To reduce agency costs, Jensen and Meckling's (1976) Agency Cost Theory highlights the use of debt financing to ease tensions between managers and shareholders. According to the Market Timing Theory, businesses should issue equity when the market is doing well and choose to take on debt when it is underperforming. According to Myers and Majluf, in the Pecking Order Theory (1984), businesses should use internal sources first, then debt, and resort to equity as the last option. As a result, research into the effects

of capital structure on businesses is still being conducted. Most people believe that the best possible balance between debt and equity must be used to maximize shareholders' wealth while minimizing capital costs (Chowdhury & Chowdhury, 2010).

The interaction between a company's capital structure and performance has continuously been a topic of discussion in the field of corporate finance. In this research, more sophisticated view of the capital structure-performance relationship is provided by investigating its non-linear characteristics. Evaluating the relationship between a company's funding decisions and overall performance becomes critical as financial markets and economic environments change. In the context of BSE-listed top 100 companies, this research attempts to provide empirical data and insights into the non-linear aspects of capital structure-firm performance relationships, illuminating possible trends and consequences for strategic financial decision-making. This research extends the body of knowledge by examining the possible non-linear relationship that exists between capital structure and performance which will help in understanding the complex dynamics that may be present in corporate financing decisions. By filling up the knowledge vacuum in the Indian context, the findings may help practitioners and academics understand the best capital arrangements for maximizing efficiency. The capital structure has a significant impact on company's financial health and with this essence, the importance of the study stems from its capacity to improve theoretical frameworks which can have an impact on policy discussions on capital structure and company performance.

The study is arranged as follows. In Section 2, the review of related literature is presented along with the research gap and hypotheses. Section 3 presents the data and methods applied for drawing the inferences and section 4 discusses the findings of the study. Section 5 draws the conclusions of the study.

2. Review of Literature

Researchers in the area of finance are interested in the connection between capital structure and corporate performance. Numerous researchers examine this relationship. According to Vatavu's (2015) research, companies that run primarily on equity perform better. These companies also partially dispose of their assets during periods of inflation and tax increases in order to save costs. However, because they typically take on risks, industrial businesses frequently turn to debt finance when they face financial troubles. The findings by Bakshani (2017) show contradiction in the results as no discernable association between performance and capital structure is found. Basit and Hassan (2017) find a significant influence of debt-equity ratio on return on asset. According to Detthamrong et al. (2017), capital structure harms stock prices, while Abdullah and Tursoy (2019) contend that financial leverage has a mediating effect on performance of large firms. However, the the positive effect of leverage on firm performance is also seen. Hirdinis (2019) finds that capital structure has a noteworthy favorable impact on a company's value, and this beneficial effect also extends to profitability. According to research by Li et al. (2019), there is a negative relationship between debt and performance of SMEs with low credit risk, whereas, there is no relationship between the two for SMEs with high credit risk. Additionally, it is discovered that while leverage boosts performance, it depresses equity prices (PeiZhi & Ramzan, 2020). While profitability and capital structure have a significant positive relationship (Shamsuddin et al. 2020), Tobin's Q does not have a statistically significant association with short-term debt. Thi and Phung (2021) report that debt-to-equity ratio has a significant negative impact on financial performance as measured by ROE and ROA which matches with the findings of Nguyen et

al. (2021). Using a sample of 1,826 businesses from 2013 to 2017, Spitsin et al. (2021) looked at how capital structure affects the success of high-tech firms in the Russian Federation. The Static Trade-off Theory is supported by the results, which show that efficient capital structure management increases the return on assets by 16–22%. The best borrowing shares depend on the size of the firm and its position within an agglomeration. The negative influence of debt-equity ratio on return on equity is also highlighted in the research by Odhiambo et al. (2022) in a Kenyan-based study. To improve return on equity, the study suggests either raising equity financing or decreasing debt. Using information from 49 businesses listed on the Istanbul Stock Exchange, the study by Kalash (2021) examines the implications of ecological sustainability on the capital structure and financial performance of Turkish-listed corporations between 2014 and 2019. The results showed that improved environmental performance raises operational profitability, return on equity, and return on assets while having a positive impact on firm leverage. These findings provide Turkish businesses with important information about how to best arrange their capital structures in the face of rising borrowing rates. In Malaysia, the investigation by Salam and Shourkashti (2019) establishes the presence of an inverted U-shaped association between capital structure and company performance. Debt and firm performance were shown to have a U-shaped connection in the context of the Egyptian capital markets, with an ideal ceiling of leverage on company performance. Performance gains were observed below this barrier. However, performance showed a decline with increase in leverage beyond a certain degree due to increased finance costs and knowledge asymmetry (Orabi & Mohamed, 2022). Le and Phan (2017) demonstrated a non-linear relationship arises between debt and corporate performance. Also, an inverse U-shaped association

between extra-financial performance (sustainable ESG) and company profitability was identified in a study conducted by Zghidi et al. (2023) on American enterprises. However, Attia et al. (2023) establishes that the effect of financing decision on performance varies with firm size; large-sized firms enjoy a positive effect with rise in debt in contrast to small-sized firms whose profitability comes down with increasing leverage.

Capital structure and firm performance are shown to be negatively correlated in Indian research by Pal (2022). Overall, the research points to an intricate link between capital structure and company performance that depends on the metrics employed. A study by Marfuah and Nurlala (2017) finds that large-sized businesses are often seen to raise capital at a lower pace and have less information asymmetry, both of which have an effect on corporate performance. Lestari (2023) observes a positive relation between firm size and return on equity for manufacturing businesses listed on the Indonesian Stock Exchange. However, the study added return on assets and debt-to-equity ratio could moderate the relationship between company size and ROA. Furthermore, additional factors including capital structure, growth potential, and operational cash flows may have an impact on the association between business size and ROA (Arifaj et al., 2023). In terms of the growth potential, according to some research, ROA is positively impacted by sales growth (Ghanbari and Ghasemi, 2015, Uddin, 2019) while others discovered no discernible influence (Goh et al., 2022). The impact of debt-equity ratio and liquidity ratio on ROA has also been a matter of debate. According to the research by Muslikin and Alim (2023), the debt-to-equity ratio increases stock returns. In a similar vein, some research discovered that the current ratio significantly increases ROA (Zaman, 2021), whilst other studies discovered an opposite effect (Gunawan & Pujiarti, 2023). So, the factors taken into consideration for

this study include ROA, firm size, growth rate, leverage, and liquidity ratios following a comprehensive examination of the numerous pieces of literature.

3. Research Gap and Hypothesis Formulation

The extant body of studies pertaining to the relationship between capital structure and firm performance concentrates mostly on the linear relationship, hence neglecting possible non-linear dynamics. In terms of the non-linear pattern, the particular setting of top BSE-listed companies has not been dealt with despite a variety of discoveries across several nations and industries. The research gap emphasizes the necessity of examining the capital structure-firm performance connection by looking at the linear and possible non-linear relationships. The researchers therefore, study both the linearity and non-linearity aspects to uncover the possible complex relationship. By using a comprehensive approach, it is possible to thoroughly examine the complex link between capital and performance, adding significant information to the field of corporate finance.

In light of this, the following null hypotheses are tested:

Hypothesis I: H_0 : There is no significant impact of the debt-equity ratio on firms' financial performance.

Hypothesis II: H_0 : There is no significant impact of firm size on the firms' financial performance.

Hypothesis III: H_0 : There is no significant impact of growth rate on the firms' financial performance.

Hypothesis IV: H_0 : There is no significant impact of liquidity on the firms' financial performance.

In addition to the above, while testing the non-linearity in the relationship, the following hypothesis is additionally considered.

Hypothesis V: H_0 : There is no significant impact of the square of debt-equity ratio on firms' financial performance.

4. Research Design

The annual data of the companies included in BSE 100 are included. However, of these, the financial services-related companies are excluded because of their different regulatory requirements and nature of business. Thus, based on this exclusion criterion, 23 companies are excluded from the sample which, thereby ensured a guarantee of uniformity and consistency in data of the remaining 77 companies included in the BSE 100 index to examine the effect of capital structure on firm performance. The study period for the research is from 2014 to 2023 which is ten years. The data collected from the ACE Equity database are a combination of cross-sectional and time series and take the form of a panel and therefore for understanding the cause-effect relationship, panel regression is applied. The literature frequently uses ROA (Return on asset), as an alternative metric to assess a company's operational, financial, and accounting performance. Several scholars have employed accounting-based ROA as

an integrative method for strengthening the comprehension of the efficiency of businesses (Mansour et al., 2022). Thus, this research utilizes Return on Asset (ROA) as the dependent variable for measurement (Saidat et al., 2019, Arenas-Torres et al., 2021, Gutiérrez-Ponce et al. 2022). Firm size (SZ) serves as one independent variable (Potharla and Amirishetty, 2021, Sari et al. 2022), calculated by taking the natural logarithm of Total Assets. Sales Growth (SALES_GR) is the second independent variable, reflecting the company's capacity to enhance its revenue over time (Harahap, 2021). Additionally, the study includes two more independent variables: Debt to Equity Ratio (DER), indicating leverage, and Current Ratio (CR), representing the liquidity of the companies.

5. Analysis and Findings

5.1 Descriptive Statistics

The characteristics of the dependent and independent variables are explained by the descriptive statistics results. To have a comprehensive knowledge of the features of the data, the mean, standard deviation, maximum, and minimum values are determined for this study. The descriptive statistics are summarized in Table 1.

Table 1: Descriptive Statistics of the Variables

Variables	Mean	Std. Dev.	Max.	Min.
ROA	10.544	11.903	76.515	-81.205
SZ	9.594	1.474	13.381	5.975
SALES_GR	17.637	69.563	1639.420	-97.020
DER	0.473	2.802	69.824	-0.641
CR	1.879	1.861	33.562	0.273

Source: Authors' computation

The descriptive statistics for the variables in the dataset are presented. With a mean of 10.544 and a significant standard deviation of 11.903, return on assets (ROA) shows significant variation in the profitability of businesses. With a mean of 9.593 for the firm size (SZ) variable, the sample's businesses

appear to be moderately sized on average. With a mean of 743.3367 and a significant standard deviation of 6636.045, sales growth (SALES_GR) shows a broad range, suggesting significant diversity in sales performance among organizations. With a mean of 0.472, the debt-equity ratio (DER)

indicates that on an average the ratio of debt fund to equity is close to 1:1. However, the sample's capital structure varies significantly, as seen by the large standard deviation of 2.801. Finally, a mean of 1.878 for the current ratio (CR) indicates that firms maintain a good liquidity position. In the context of the research, these descriptive statistics help in understanding the distributional properties of the important variables.

5.2 Regression Results

The researchers consider the application of panel regression. This study has been divided into two phases. The first phase looks at the regression model in linear terms, while the second phase estimates the model in quadratic terms. This is done to get a nuanced view of the dynamics involved.

Phase I: Linear Regression Model

Multiple regression analysis on panel data has been applied to examine the strength and direction of each variable. The linear regression may be written as follows:

$$Y_{it} = \alpha + \beta \cdot x_{it} + \varepsilon_{it}$$

Where, Y_{it} = Dependent variable at time t

α = constant term, β = $K \times 1$ vector of coefficients, x_{it} = $K \times 1$ vector of independent variables, ε_{it} = Error term, t = time and i = firm

The following model is used to assess how capital structure affects a company's performance under the linear setting:

$$ROA_{it} = \alpha + \beta_1 \cdot (SZ)_{it} + \beta_2 \cdot (SALES_GR)_{it} + \beta_3 \cdot (DER)_{it} + \beta_4 \cdot (CR)_{it} + \varepsilon_{it}$$

In order to assess the matter of severity of multicollinearity, VIF values are computed. The maximum value of different variables is found to be 1.05. This result confirms that the variables are relatively independent of each other and thus multicollinearity does not exist. Also, the test for heteroscedasticity is performed to check whether residuals have constant variance.

Analysis based on Ordinary Least Square (OLS) Model, Fixed Effect (FE) and Random Effect (RE) Model: Linear Regression

One popular linear regression model that is particularly useful for modelling continuous variables is the OLS model. By lowering the sum of squared errors, OLS calculates the association in this model between the response variable, ROA, and the five predictor variables, SZ, SALES_GR, DER, and CR. The Fixed Effects (FE) model is utilized to investigate the variability of characteristics particular to a group and evaluate their impact on Return on Assets (ROA). The Random Effects (RE) model, on the other hand, is capable of handling panel data that is both time-varying and time-invariant. It assumes that each effect is dispersed randomly and has no relationship to any of the independent variables. The result of the OLS, FE and RE model is given in Table 2.

Table 2: Analyzing the Regression Results

Ordinary Least Square (OLS) Model			Fixed Effect (FE) Model			Random Effect (RE) Model		
Variable	Coefficient	t-stat	Variable	Coefficient	t-stat	Variable	Coefficient	z-stat
SZ	-0.661**	-2.06	SZ	0.415	0.73	SZ	0.078	0.16
SALES_GR	-0.000	-0.19	SALES_GR	-2.20e-06	-0.06	SALES_GR	-3.96e-06	-0.10
DER	-0.169	-1.02	DER	0.211**	2.30	DER	0.192**	2.09
CR	0.745***	2.96	CR	1.284***	6.88	CR	1.262	6.92
F-stat (4,648)	4.34		F-stat (4,576)	13.44		Wald Chi ² (4)	51.81	

*** Significant at 1% level; ** Significant at 5% level

Source: Authors' computation

The F-statistic value of 13.44 ($p=0.034$) shows the rejection of the null hypothesis. Hence, the FE is found to be a better one than OLS. The result of the Breusch and Pagan (1980) test shows a χ^2 value of 51.81, which thereby rejects the null hypothesis H_0 and accepts the RE model over the OLS model. In order to make the final selection, the Hausman (1978) test is applied which shows a χ^2 (3) value of 11.84 ($p=0.008$), thereby rejecting the null hypothesis. The researchers, therefore, consider the Fixed Effect model as the best choice. However, the robust method is applied to handle the heteroscedasticity problem. According to the FE model's conclusion, the variable 'SZ' has a coefficient of 0.415 and a t-statistic of 0.73, meaning that at a conventional significance level, its influence on the dependent variable is not statistically significant. With a t-statistic of -0.06, 'SALES_GR' has a coefficient of -2.20e-06, indicating a minimal effect. With a coefficient of 0.211 and a t-statistic of 2.30, the variable 'DER' has a statistically significant positive influence. Similarly, the CR variable with a t-statistic of 6.88 and a coefficient of 1.284 indicates a significant positive influence.

Phase II: Quadratic Regression Model

This phase estimates the model in quadratic terms. The estimated model is written as follows:

$$Y_{it} = \alpha + \beta \cdot x_{it} + \gamma \cdot \text{DER_SQ}_{it} + \varepsilon_{it}$$

Where Y_{it} = Dependent variable at time t

α = Constant, β = $K \times 1$ vector of coefficients, x_{it} = $K \times 1$ vector of independent variables, γ = Coefficient associated with the quadratic term x_{it}^2 , x_{it}^2 = Squared term of the independent variable, ε_{it} = Error term, t = Time and i = firm

In order to test for the non-linearity in the relationship, the quadratic term is considered by including the squared value of the transformed DER variable. The following quadratic regression model is used to assess how capital structure affects a company's performance:

$$\text{ROA}_{it} = \alpha + \beta_1 \cdot (\text{SZ})_{it} + \beta_2 \cdot (\text{SALES_GR})_{it} + \beta_3 \cdot (\text{DER})_{it} + \beta_4 \cdot (\text{CR})_{it} + \gamma \cdot \text{DER_SQ}_{it} + \varepsilon_{it}$$

The diagnostic tests are applied considering the variables given in the above equation. The test for multicollinearity is run. The VIF values show that the maximum value exceeds 10, thereby showing high correlation among the independent variables. Hence, in order to handle the issue, the variable, DER is transformed by adjusting for the mean. The transformed variable is:

$$\text{DER_Centred} = \text{Original DER} - \text{avg}(\text{DER})$$

Hence, to handle the multicollinearity problem, DER is transformed by deducting the average DER (0.472) from the original DER value to get the transformed DER (DER_Centred) value which is then squared again to get the transformed value of Square of DER_Centred. Again, the test for heteroscedasticity is done using White's test to test for the null hypothesis that the residuals have constant variance. The test shows that the p-value is less than 5% which points to the presence of this problem. Hence, the robust standard error results are considered.

Analysis based on Ordinary Least Square (OLS) Model, Fixed Effect (FE) and Random Effect (RE) Model: Quadratic Regression

The results of the OLS, FE and RE models after considering the quadratic term squared- DER are given in Table 3.

Table 3: Regression Results based on Ordinary Least Squares (OLS), Fixed Effect (FE) and Random Effect (RE) Model (Quadratic)

Ordinary Least Square Model			Fixed Effect (FE) Model			Random Effect (RE) Model		
Variable	Coefficient	t-stat	Variable	Coefficient	t-stat	Variable	Coefficient	z-stat
SZ	-0.194	-0.61	SZ	0.482	0.84	SZ	0.152	0.32
SALES_GR	-4.85e-07	-0.01	SALES_GR	-2.47e-06	-0.06	SALES_GR	-4.54e-06	-0.11
DER	-0.169***	-6.76	DER	-0.238	-0.42	DER	-0.622	-1.12
DER ²	0.0736***	6.68	DER ²	0.007	0.81	DER ²	0.012	1.49
CR	0.401	1.61	CR	1.273***	6.79	CR	1.235***	6.71
F-stat (4,647)	12.64		F-stat (5,575)	10.88		Wald Chi ² (5)	53.01	

*** significant at 1% level

Source: Authors' computation

The F-statistic value of 10.88 along with the p-value of less than 5% shows the rejection of the null hypothesis. Hence, the FE is found to be a better model than OLS. The result of the Breusch and Pagan (1980) test shows that the computed χ^2 (5) value is 53.01 with a p-value of less than 1%, which thereby rejects the null hypothesis H_0 and accepts the RE model over the OLS model. In order to make the final selection, the Hausman (1978) test is applied which showed a χ^2 (4) value of 31.64 with a p-value of 0.000 which again rejects the null hypothesis H_0 and concludes that the Fixed Effect model is the best choice. However, the robust method is applied to handle the heteroscedasticity problem. The results of the Fixed Effect (FE) model provide insights into the relationship between the different independent variables and ROA. According to the t-statistic of 0.84 and the coefficient of 0.482 for size, the firm's size is not statistically significant. With a t-statistic of 0.06, sales growth (SALES_GR) has a negative coefficient of close to zero, indicating that there is no statistically significant effect on the explained variable. In the case of capital structure, the coefficient is negative 0.238 (t-statistic = 0.42) showing that there is no statistical relationship between the level of debt-to-equity ratio (DER) and accounting profitability. In the same tune, the quadratic

term of DER has a coefficient value of 0.007 (t-statistic = 0.81) which therefore indicates a statistically insignificant yet positive association with ROA. The firms' liquidity measured using the current ratio shows a coefficient of 1.273 (t=6.79). Thus, it shows that it exhibits a positive and statistically significant effect on ROA. However, firm size, sales growth, and debt-to-equity ratio do not have a significant influence on ROA.

6. Concluding Remarks

Capital structure is an important aspect of the decision-making process in the present day business houses as it is associated with issues like financial prudence, value orientation, and risk analysis of the firms, and has attracted the interests of different researchers for a long time. The study focuses on the top 100 companies listed on the Bombay Stock Exchange (BSE 100) and expands on previous research by examining the non-linear characteristics associated with the capital structure-firm performance connection. The basis of this consideration stands on the yard-stick that the effect of capital structure modifications will not always follow a straightforward linear pattern (Salam & Shourkashti, 2019). In order to facilitate a more flexible and in-depth investigation of the potential effects of capital structure

adjustments on company performance, the study emphasizes quadratic terms in an effort to identify curvature or turning points in the relationship. Incorporating quadratic terms into the analysis also makes it easier to analyze the statistical significance of non-linear components, guaranteeing a thorough analysis of the data and offering insightful information about the relationship between capital structure and company performance (Raharja & Mranani, 2019; Attia et al., 2023).

The present study highlights that the quadratic regression model failed to find any effect of the major independent variables on the dependent variable ROA. However, a positive effect of debt-equity ratio was

established in the linear model. This result goes in line with the findings of Olajide et al. (2017); Shamsuddin et al. (2020) and Wuryani (2022), but goes against the findings of Salam and Shourkashti (2019), Jamil et al. (2021) and Nguyen et al. (2021). It is also observed that although sales growth and firm size do not show effect on performance, liquidity level shows a significant positive effect on performance. Overall, this study offers a piece of insightful information that will help practitioners, scholars, investors, and financial managers to arrive at well-informed decisions for sustainable stability and efficiency of the businesses in the days to come.

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